THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1379.] LONDON, OCTOBER 15, 1889. [41ST YEAR. Price 6d.

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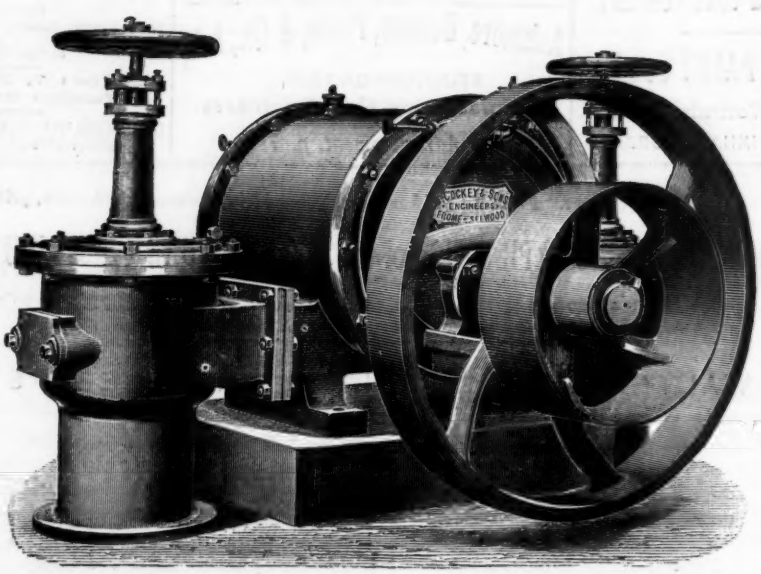

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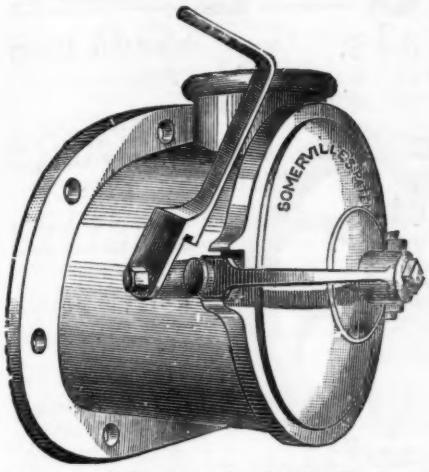

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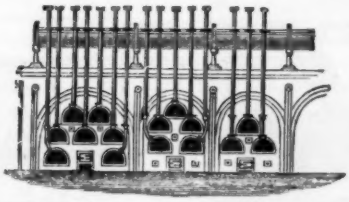

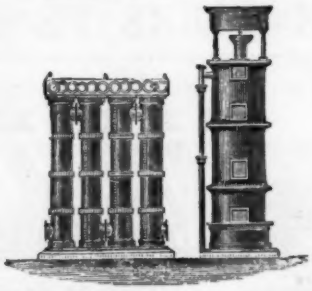

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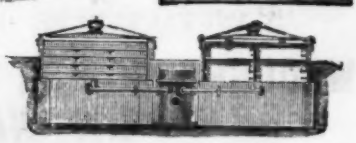

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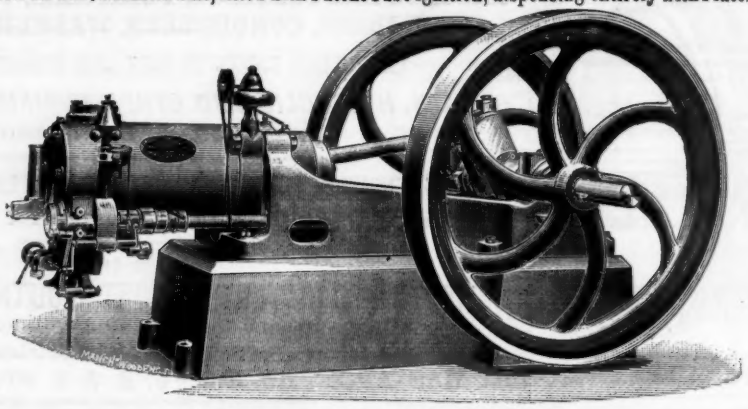

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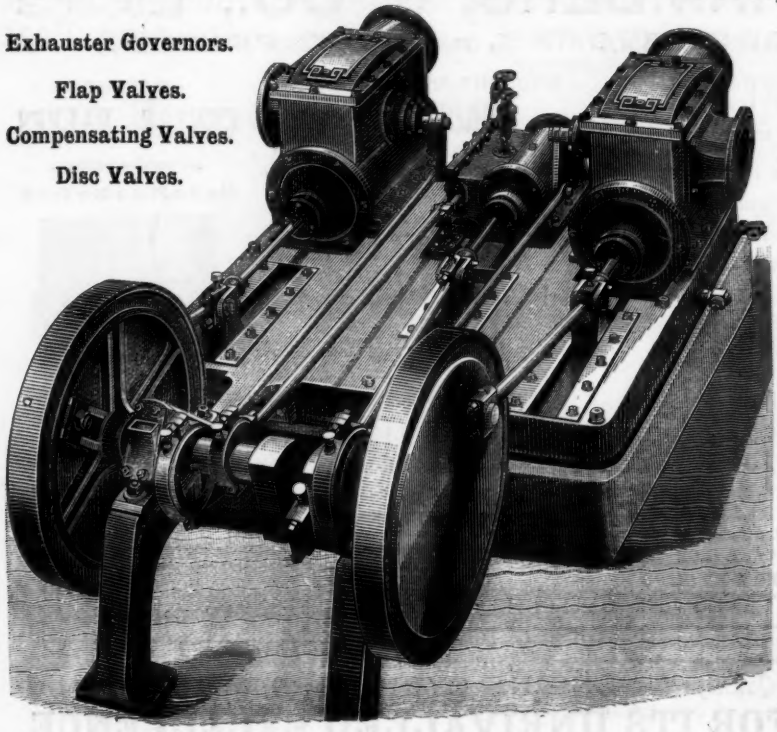

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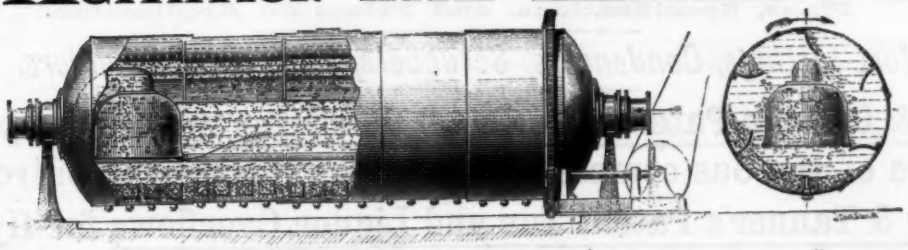

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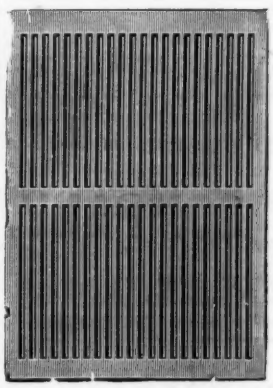

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Thoroughly extracts every grain of Ammonia and a large quantity of other Impurities from Gas.

Has been for many months in successful and satisfactory operation at The Gaslight and Coke Company's Station at **BECKTON,**

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A very large amount of patronage has been accorded the "Standard" Washer-Scrubber, of which, up till now, **367** have been supplied, representing a daily make of **318,260,000** cubic feet of gas; but the advantages of the **"New Standard"** will be readily recognized, and its superiority over the present "Standard" may be briefly summarized as follows:—

1. The weight in motion is **only one-seventh** of that in the present machine.
2. It requires **only one-seventh** the power to drive; consequently effecting a large reduction in cost of Engine as well as in steam power.
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4. It has been found that the washing surfaces **keep perfectly clean** and free from deposit from end to end of the Machine.
5. It is so constructed that it forms a most powerful, effective, and complete system of purification, gives no pressure, and can be removed and replaced without trouble or injury.
6. The "New Standard," owing to the foregoing, can be supplied at **a large reduction in price.**

Engineers desirous of working Ammoniacal Liquor over and over again prior to leaving the "New Standard" can do so by the automatic and simple arrangement which forms part of this Patent.

The Apparatus can be applied to "Standard" Washer-Scrubbers already in use.

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IN CAST-IRON AND TIN CASES.

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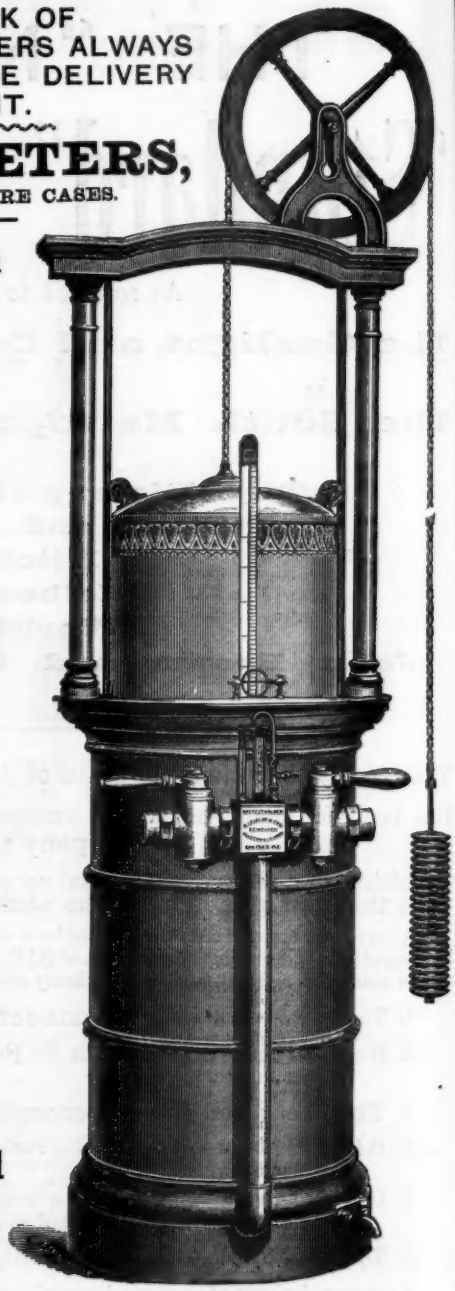

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The most Economical, Reliable, and Handy Tool for Forge Work for

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AND FOR USE IN

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THE TANGYE GAS-HAMMER

(ROBSON & PINKNEY'S PATENTS)

As supplied to several of the principal Gas-Works.

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SOLE MAKERS.

As supplied to several of the principal Gas-Works.

(From Photos of the ¾ cwt. size.)

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"*Since the appearance of our* ['*The Engineer*'] *notice, the Hammer has been in some respects re-modelled, and its remarkable economy placed altogether beyond a doubt. . . . The Hammer described is that known as the ¾ cwt. size, and has a cylinder of 7 in. diameter and 6½ in. stroke. The maximum blow is very nearly that which would be given by* **a weight of 3 cwt. falling through a height of 1 ft.**; *and this can be repeated at the rate of* **110** *blows per minute. . . . Extended test in practical smith work has demonstrated that over* **2500 of the heavier blows** *referred to above, can be given with* **one pennyworth of gas** *at half-a-crown per* 1000 *feet—i.e., the Birmingham price to small consumers—or over* 4500 *varying blows for the same consumption.*"—"**The Engineer,**" **Sept. 10, 1886.**

The Gas-Hammer dispenses with Boilers, Coals, Ashes, and Dirt necessitated by Steam-Hammers.

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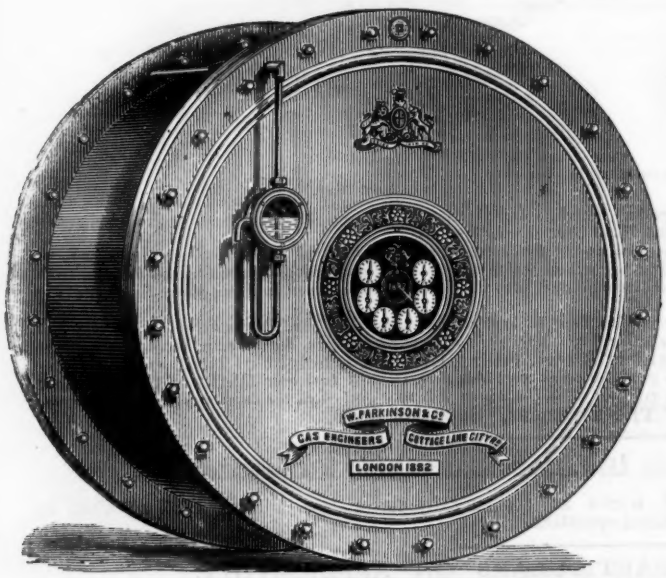

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 15, 1889.

END OF THE BRISTOL STOKERS' STRIKE.

THE Bristol gas stokers' strike is all over, and the men have gained the day. There is no possible use in disguising the fact, or hushing it up. The men left their work rather than accept the terms offered by the Directors, which they declared meant more labour; and they have gone back again upon the relinquishment of this point by the Directors. If there remain any other points on which disagreement has existed, they are reserved; but there is small doubt that the men will get their own way in them also. Not to put too fine a point upon it, the whole affair has been miserably mismanaged by the Bristol people, who have drawn upon themselves the justifiable wrath of every gas manager in the South-West of England. They advertised and placarded in the neighbouring towns for men, apparently utterly careless whether they seduced the best stokers from their engagements in places where it might not have been easy to replace them, or whether their offers might unsettle labour relations in every gas-works in the western counties. They offered constant employment to some, and several months' work to other men who might take service with them; and at home they defied their old hands to do their worst—making great parade of victualling and equipping their works to stand a siege of weeks' duration. As the day drew near for the men to go out, the heads of departments were seen rushing about everywhere and wiring aimlessly to all parts of the kingdom for assistance. Their whole story was that they never, never would give in; and it was generally understood that they meant to act on the lines of our last week's article, and fight the matter out in the way they had marked for themselves, at all hazards and all costs. Yet what has happened? In the very first skirmish of the campaign the men showed as much generalship and determination as the Company displayed ineptitude. On the very day and at an hour when it was known that 600 gas stokers would be free to do what they liked in a city which counts only 350 constables for all purposes, the Company had their first relay of fresh hands brought in by train, and set them up in brakes to be drawn through the streets to the works! Could they not have foreseen that these streets would be filled with a desperate mob, very probably of three roughs and idlers to every gas stoker, and that the unfortunate new-comers would be stuck up like "cockshies" for stones to be aimed at them? At any rate, this is exactly what happened. The small force of police that could be obtained to protect the railway station was powerless to convoy the waggonettes full of men to the gas-works, especially as the strikers had artfully barricaded the narrow way with an overturned cart or two just in the nick of time. Consequently, the raw levy broke and fled in all directions; and if any of the gas-works officials were on the spot, they must have looked exceedingly foolish. The strikers remained masters of the situation from that moment, which was the Tel-el-Kebir of the Company; and a day or two later—yielding, it is reported, to representations from without—the Directors gave in. The strikers returned in triumph, and such strangers as had succeeded in reaching the gas-works and commencing their employment, were sent home again. There is no difficulty in imagining what was the purport of the representations that led the Directors to confess themselves beaten. "If this is all you can do by "way of fighting, for goodness' sake give over, and make "the best of a bad job." This is the long and short of the advice that must have come to them from outside; and it is so much to their credit that they took it. We are aware that these comments may be characterized as harsh upon the officials who have been engaged in this warfare; but it is their own fault for getting beaten. Everything is pardoned in the general who obtains a victory; but nothing excuses him who is defeated.

As we said last week, a Gas Company has no business to enter upon a struggle with men unless it is to win; and the advisers who in this case counselled fighting, and then could not bring the Company victoriously out of the first skirmish, have a great responsibility resting on them. This is not our view alone, for in an article on the subject the *Globe* has remarked that gas and water supply are far too important undertakings to be imperilled by labour disputes, which should never be allowed to go to the extent of a strike in such cases. We do not wish to say a word in disparagement of any man; but a gas workers' strike, followed by a "cave-in" on the part of the management, is a serious matter. The Bristol Managers had a splendid opportunity for dealing the first effective blow against the men who preach and practise principles utterly subversive of the old relations between employers and employed. If they had not felt equal to the emergency, they ought to have temporized, bowed before it, and passed the difficulty and the glory on to stronger hands. In what they have done, they have exasperated everybody and pleased nobody. They would have deservedly reaped unstinted applause if they had been able to fill their works with men, and keep the strikers out until they came back cap in hand. Even their enemies would then have conceded their ability; whereas now the only thing to

be said is that they have strengthened the enemy's hand, and made it only too probable that worse troubles will arise elsewhere—perhaps with their own conquerors of the present—and will be much more difficult to deal with when they come.

THE DUBLIN GAS SETTLEMENT.

The ludicrous side of the Dublin gas settlement was dealt with in these columns last week; and we have no desire to make any further remarks upon the spectacle presented by the Corporation and the Company, when the very sight of the Arbitrators' Court brought them to an agreement that they had spent years in trying to attain. It is necessary, however, to state very briefly the nature of the settlement actually concluded. We published the heads of the agreement last week, from which it will be seen that a fruitful source of unpleasantness between the Corporation and the Company—the "dual control" of the street lamps—has been terminated. In a town where more amicable relations commonly obtained between the Corporation and the Gas Company than has been the case in Dublin, the complication that formerly ruled here between the ownership, lighting, supervision, and repair of the street lamps would have led to misunderstandings. Henceforward these matters pass wholly into the hands of the Corporation, who will buy up the entire public lighting plant and manage it, so that the Company will have nothing to do with it beyond supplying the gas—of course, with reasonable facilities for inspection of governors, meters, &c. A new and satisfactory gas-testing station is to be established; and henceforth the Company are to charge for the gas supplied for public lighting at the lowest rate paid for the time being by any private consumer. There has been trouble on this score, owing to the Company allowing to certain large consumers special discounts to which they did not consider the Corporation were entitled. In view of these concessions, the Corporation have agreed to pay the disputed gas account in full, as well as the Company's costs in regard to their action to recover the same; each party to bear their own share of the expenses of the arbitration. Everything now depends upon the spirit in which the parties carry out their new engagements. If the Corporation on the one side, and the Directors of the Gas Company on the other, resolutely determine that all the old bickering and attempts to get the better of one another, in the spirit of the smallest tradesman, that used to mark the relations of the Corporation to the Company, shall cease, they will doubtless find means of carrying their wishes into effect. Now is the opportunity for burying bygones, and beginning afresh; and if it is thrown away, there may never occur, in the lifetime of the present administrators on both sides, so favourable an occasion for making peace.

THE ADOPTION OF THE OXYGEN GAS PURIFICATION PROCESS AT RAMSGATE.

The formal adoption of the oxygen process of gas purification by the Ramsgate Corporation marks the close of the experimental, and the opening of the industrial era in the history of an interesting application of chemistry in gas manufacture. The commercial separation of oxygen from the atmosphere is in itself a triumph of chemical industry; but it is curious that so few uses for the separated gas presented themselves at the outset. It was as though civilization, having done with diluted oxygen for so long, could not immediately find useful applications for the pure article. Its adoption for facilitating the purification of coal gas was an afterthought, but a fortunate one for the owners of the process; for when it was placed in the hands of a practical Gas Engineer, it was soon stripped of the laboratory refinements that had hindered its industrial progress, and re-moulded in accordance with the every-day requirements of a factory. But for this adaptability, oxygen would never have recommended itself to gas manufacturers; and, as we have acknowledged on previous occasions, it is to Mr. W. A. Valon that the credit for effecting this change in the method of oxygen separation must be given. Mr. Valon is sanguine respecting the saving to be effected in gas-works where the oxygen process is adopted; but this is a point upon which more experience is needed. We are not at present prepared to accept the assertion that the oxygen process will compare favourably in point of cost with the air process; but we should be very sorry if the prospects of an admittedly interesting and promising system could be supposed to rest entirely on the question of a possible saving. Rather would we believe that the possibility of improving the process of purification, especially when there is no reason to suppose that the improvement will be attended by increased expense, will be sufficient attraction to many gas managers honestly desirous of doing their best by their employers and the public. There has not been any noticeable rush on the part of Gas Companies and Corporations after the oxygen process, simply because it does not hold out any prospect of heavy savings; but we hope that it will be tried in different parts of the country on its other merits. It is out of no want of faith in Mr. Valon that one acknowledges a desire to learn how the process would work in other hands. It is his child; and no one can tell how a child will turn out until he has left home, and fairly entered upon his battle with the world.

ELECTRICITY AND GAS FOR STREET LIGHTING.

It was only to be supposed that the electrical journals would take disdainful notice of the remarks of Sir Robert Rawlinson and Mr. George Livesey at the recent meeting of the Commercial Gas Company on the subject of the unsuitability of electric arc lamps for street lighting. The *Electrical Review* observes: "What funny reading this will be ten years "hence! Poor benighted Livesey!" This is very crushing, no doubt. But the prophetic turn which is given to our contemporary's scornful comment reminds one of the many prophecies uttered by electricians that have become decidedly "funny reading" during the past ten years; and thus takes off the edge of the sarcasm. It was only five years ago that the great Edison himself prophesied that at the expiration of this period gas would be nowhere and electricity everywhere in New York; but the truth is quite contrary to the prediction. And how very odd the newspaper articles and speeches at the commencement of the present decade on the coming light read now! If Mr. Livesey is really "benighted" by his interest in gas, it is very probable that a good many electricians would like to be similarly afflicted. Some electricians appear to wish the world to believe that, because a man happens to be pecuniarily or professionally interested in gas supply, his opinion about electric lighting is worthless; but they teach otherwise with regard to the opinions of a professional electrician upon gas and oil lighting. This is absurd; and we hope it is an error that we shall never fall into. In the notices and comments on both electric lighting and gas matters that appear in the Journal, we endeavour to show fair play to both sides, and should not think of attempting to extinguish the statements of Edison, Forbes, or Preece by a cheap sneer and a cheaper assumption of the prophet's mantle. Why, instead of affecting to jeer at Mr. Livesey, did not our contemporary devote a little serious attention to Sir Robert Rawlinson's criticism on the waste of light at the Forth Bridge? If electricians would but reason with their critics, instead of trying to despise them, they might learn something to their advantage. It seems hopeless, for instance, to convey to some electricians the idea that the electric arc lamp is really regarded by many people as unsuitable, by reason of its brilliance, for ordinary street lighting. Yet we can assure them such is the fact, and that such road lighting as Mr. Livesey cited, at Brighton, or as may be seen at Hyde Park Corner, is really and truly more suitable for the purpose, in the estimation of many competent and impartial judges, than the glare that could be made by arc lamps. They have to learn the lesson that, although some people may be dazzled, mentally as well as physically, by the thousands of candle power which the arc light gives, because it cannot help itself, yet the effect is apt to leave an extremely unpleasant impression after it. Many surveyors and others whose common sense survives the contemplation of the thousands of candle power with which electricians would illuminate every street in the kingdom, if they could have their own way, understand that, when it is simply desired to show a useful light in the roadway, diffused lights are the first essential. The electric arc is not a diffused light; and the very electricians who affect to laugh at those who do not admire it, would give their ears to find out how to divide it in a more useful manner. When the electric arc can be subdivided at will so as to give any proportionate fraction of the present power—say from 40 to 100 candles—at a proportionate cost, it will be far more suitable for street illumination than it is now. There are many purposes for which the electric arc in its present proportions is more suited than for street lighting; and electricians know this very well, or they would never attempt to use the costly and delicate incandescent lamp in its stead.

CONSUMERS' LEAKY FITTINGS.

A statement has been made by Mr. Samson Fox, of water gas notoriety, that, as a rule, the internal gas-fittings of

houses where gas is burnt are in such a bad state that at least 25 per cent. of the consumption registered by the meter goes for leakage. It is a remarkable evidence of Mr. Fox's hardihood that he should have risen in the public meeting of a body like the Iron and Steel Institute and offered such an astounding contribution to the recorded transactions of that organization; but it is not less extraordinary that there was nobody present to correct him. We are not going to demonstrate the absurdity of these declarations on the part of Mr. Fox, by illustrative calculations. This has been effectually done by Mr. J. Ferguson Bell and others; yet still whenever Mr. Fox speaks on the subject, he talks on in exactly the same strain. It is to be hoped that any large gas consumer who has heard and permitted himself to be startled by these assertions will have long ere this convinced himself, by a simple and easily conducted experiment with an air-pump and a pressure-gauge, of the staunchness of his own gas pipes. While on this subject, it may be worth while to notice a remark made by General Webber before the British Association in Newcastle to the effect that, except for Government work, he had never come across anything like a general specification of gas-fitting work which provided for testing its soundness. It can only be said, with regard to this observation, that the speaker cannot have had much experience of good gas-fitting work. It is true that architects are not, as a general rule, half particular enough in the matter of gas-fittings for houses and public buildings erected under their supervision; but it will not do to allow the idea to get abroad that no care whatever is taken of the manner in which gas-pipes are laid in any building. As a matter of fact, the fitting up of an important building with gas-pipes is a large order, which requires the greatest care in carrying out. Section by section the pipes are tested as soon as laid, and before they are covered up out of sight; and if a cubic foot of gas per day leaks out through a split pipe or a bad joint, the tester will assuredly discover it. Unhappily, in the houses erected by the speculative builder, in which the vast majority of gas consumers dwell, the gas-fittings are put in, if not exactly "any-"how," still in many cases without sufficient care. As with lightning-rods, so with gas-fittings, however, excellence at the start does not necessarily imply maintained perfection. The soundness of the gas-pipes of all public buildings (and private ones too for that matter) should be tested once a year, and the fact duly recorded where it can be made available for comparison from year to year. We can engage, moreover, that in any case where a consumer would like to have his pipes tested, the Gas Company or Corporation would willingly send an official to do the work, which would only take a few minutes. A little service of this kind would cost nothing, and go a very long way sometimes, while satisfying the consumer that the full quantity of gas which the meter records as having entered into his house has in truth passed out through the taps and burners, and in no other way. Taking gas-fittings in houses as they are, it would be a useful task if some gas manager, with means and opportunity for the work, would take a number of typical houses at hap-hazard, and ascertain what becomes of the gas paid for as having passed through the meter, showing how much is lost by leaky fittings, how much wasted by bad burners, and, in short, what is the average duty obtainable by the consumer out of the gas with which he is supplied. In some instances the results might be startling.

MID-SUSSEX WATER COMPANY, LIMITED.—By an advertisement which appears elsewhere in to-day's issue, our readers will see that the Directors of the above Company are about to issue at par the unallotted capital, consisting of 3576 shares of £5 each. The Company have powers over a large residential district, having a population of 14,000, in which a good supply of water has been much needed. This the Company will very soon be in a position to afford, as the works (which are being constructed by Messrs. J. and H. Robus, of Mansion House Chambers, from the designs of Mr. Jabez Church, M. Inst. C.E., the Company's Consulting Engineer) are making such satisfactory progress that their completion early next year may be confidently expected. The quality of the water has lately been reported upon by Dr. Percy F. Frankland; and it has been pronounced by him to be excellent for drinking and all other dietetic purposes, while the yield is abundant. That the residents in the district of supply will avail themselves of the great boon which the Company will offer to them, there cannot be the smallest doubt; and therefore it may be anticipated that the success of the undertaking will be quite equal to that of others of a similar kind, some of which are mentioned in the advertisement.

Water and Sanitary Affairs.

THE "Analysis of the Accounts of the Metropolitan Water "Companies," compiled by Mr. Alfred Lass, F.C.A., now extends to the ninth year. The volume just published proceeds on the same lines as its predecessors, and embodies an immense amount of information, presented in a form at once concise and comprehensive. Among the various items of a statistical nature, we meet with the somewhat remarkable fact that the supply of water to the Metropolis was less last year than in 1887; the decrease being nearly 1,400,000 gallons in the average daily supply. The fact is doubtless to be accounted for, in a great measure, by the circumstance that 1887 was a year of drought. While many towns were suffering from a scarcity of water, and there was an actual water famine in several of the rural districts, London was able to draw an abundant supply; and the Metropolitan consumers clearly took advantage of their opportunity. The extension of the constant supply in 1888 was considerable, comprehending more than 25,000 houses; while the actual increase in the number of houses supplied, whether on the intermittent or the constant plan, was a little over 13,000. Thus there was a clear gain to the constant service of more than 12,000 houses. The increase was most marked in the district of the Southwark and Vauxhall Company, where it amounted to more than 14,000 houses, or above half the total advance of the constant service throughout London. A different result was shown by the New River Company, who made only about half the progress with the constant service last year that appeared to their credit in 1887. The achievements of the Lambeth Company in this way fell off still more; while the Kent Company made a good step forward. The greatest drop in the spread of the constant service occurred in the case of the West Middlesex Company; only 621 houses being added to the list, as compared with an addition of 2763 a year earlier. Speaking of the supply generally, the direction in which London is growing is shown by the circumstance that by far the largest addition to the number of houses last year was in the districts of the East London and New River Companies; and next in order comes the district of the Lambeth Company. These three make up more than half the total increase in the number of houses supplied. At the close of the year the capital expended by the eight London Companies exceeded 14½ millions, with nearly £100,000 remaining in hand, and power to raise another million in shares and loans. The dividends paid during the year amounted to rather more than £900,000; being at the rate of 3·65d. per 1000 gallons of water supplied. The net profit on stock and share capital is shown to have been 9·23 per cent., as compared with 9·15 per cent. in the previous year. Among the items of current expenditure, rates and taxes (exclusive of income tax) continued to increase; rising from £142,000 in 1887 to £149,000 in 1888, as compared with £90,000 nine years ago.

A PUBLIC LIGHTING QUESTION AT PORT ELIZABETH.—According to advices which have just reached us from South Africa, the inhabitants of Port Elizabeth have lately been exercised over the question of the public lighting of the town. It appears that some months ago the lighting had to be discontinued because the municipal finances were unequal to meeting the cost; and there was some difficulty in raising the necessary amount. Consequently the services of the Gas Company, as far as the street-lamps were concerned, were dispensed with. It is unnecessary to deal here with the causes which led to this decision; it is sufficient to say that it has since been regretted. Not only has there been internal dissatisfaction, but residents in neighbouring districts naturally showed reluctance in visiting a town whose streets were in darkness; in addition to which certain distressing accidents and cases of assault, mainly attributable to the existence of a condition of things so favourable to their occurrence, roused the inhabitants to a sense of the importance of having the streets lighted. A public meeting was held early last month, under the presidency of the then Mayor (the Hon. H. W. Pearson—a gentleman whose name is identified with all the principal public works which have been carried out in the town), for the purpose of considering the question; and a resolution was unanimously passed in favour of the re-lighting of the lamps. A pledge was given to support the Town Council by passing any rate they might levy for the purpose; such rate not to exceed a 1d. in the pound on the tenants' rental and ½d. on the landlords' rental per annum. At the meeting of the Council on the following day, the Mayor submitted a motion to the effect that the lamps should be re-lighted, as far as possible, by the 1st inst.; and it was carried unanimously. An Act will probably be applied for to sanction the raising of a special lighting rate.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 759.)

The Money Market has again controlled the Stock Markets; and with easier rates came a recovery in prices. The general improvement, however, was not of any magnitude, or indeed of much stability; for prices were inclined to fluctuate pretty well daily, and, on the whole, the volume of transactions was not large. An immense number of new and speculative enterprises are spreading their nets before the simple public; and, as a certain proportion of these tempting gold-traps are bound to catch their birds, money is likely to be kept pretty briskly employed. As for the Gas Department, it was fairly active through the better part of the week; but it tailed off rather towards the close. The general tendency has been flat. In Gaslight issues, the "A" opened unchanged, and remained fairly steady, though not strong, until Saturday, when it gave way and fell 2½. The lowest mark of the day was 248¼; but the final was 250½, which was as good as the opening. The "H" was offered on Monday, and fell 3½—not altogether a matter of surprise, seeing that it had not been varied at all while the "A" was being knocked down so liberally. At the close, however, it seemed inclined to be firmer. The other issues were quiet and unchanged. South Metropolitan came in for further ill-treatment by the bears. A "special" deal was marked in the "A" at 306 on Thursday; and down went the quotation 5. But subsequent transactions were 4 or 5 higher. The "B" was down as low as 229 more than once, and is quoted 1 lower; and a single transaction in the debenture stock was not at the best figure. All those who care for a prime chance of securing a good thing, should bear in mind that the Company will be issuing £50,000 of this stock by auction at the Mart next Friday. Commercials have been left alone all the week. The fact is that the Company is doing so well (as all the world learned through what transpired at the general meeting) that the bears hesitate to touch it. Suburbans and Provincials again supply no material for history. The Foreign division have participated in the prevailing easiness; the most noteworthy features being a relapse of 1 in Monte Video, and ¼ in Bombay. The Water Companies have enjoyed their usual repose. The only changes are a fall of 1 in Lambeth, and a rise of 1 in Southwark ordinary.

The daily operations were: Gas business on Monday was nearly all in Gaslights. "A" was steady, but "H" fell 3½. Monte Video was 1 lower. Lambeth Water was not in good odour, and fell 1. Gas continued fairly active on Tuesday at moderate prices, and was about the same on Wednesday, without quotations moving either day. Business was quieter on Thursday, and prices generally were not very good. South Metropolitan "A" fell 5; and "B," 1. Bombay receded ¼; but Imperial Continental was 1 higher for buyers. Friday was extremely quiet, and without incident. On Saturday, Gaslight "A" was lowered 2½; but South Metropolitan "A" was rather better. In Water, Southwark ordinary rose 1.

ELECTRIC LIGHTING MEMORANDA.

DELAY IN STARTING THE DEPTFORD STATION—LOCAL AUTHORITIES AND ELECTRIC LIGHTING—GENERAL WEBBER ON THE CHELSEA ELECTRIC LIGHTING SYSTEM.

The first of October has come and gone, and as yet there is no sign of the Deptford electric lighting station getting to work, as was promised. We are not surprised at this delay, seeing the immense size of the apparatus in course of erection at this station, and the imperative necessity that lies on the management to make sure that when they begin to supply they shall be in a position to keep it up. Seeing, however, that nobody asked the Company to make a start on the first of the month, or at any other fixed time, it was superfluous on their part to offer any such engagement. The fact of their breaking it will naturally be regarded, by those who think about it at all, as one more evidence of the unreliability of electricians, if not of electricity. Meanwhile, there cannot be said to be any "bitter cry" on the part of those of the public who are deprived of the supply which they have been promised. Doubtless, when the Deptford station once gets to work, and those wonderful mains of Mr. Ferranti have been proved to be able to carry their 10,000 volts of pressure without leaking, there will be plenty of consumers. Mr. Edison said a wise thing when he was in London, about the results of a breakdown and suspension of the supply. Somebody remarked that if the Company put the town in darkness once their prospects would be ruined—"Twice," said Mr. Edison, "You would be forgiven the first time on the score of inexperience, incompleteness of apparatus, or some such excuse; but the second collapse would ruin you." There is much reason in this observation; but for all that it is probable that one general breakdown would be a bad thing for the fortunes of any great electric light company. They would complain, of course, of the injustice of condemning them for a single fault; but it would not be for that one taken by itself. People would instantly remember all the disappointments that electricity—as applied to lighting—has inflicted on its supporters, and would jump to the conclusion that it could never be trusted, even after all that skill and money can do in order to make it reliable had been done.

The statement we made in this column last week respecting the conflict in the minds of local authorities over the problem of whether to undertake electric lighting or not, is illustrated by the divergent decisions arrived at by different corporations in Lancashire. The Rochdale Corporation are disposed to do what we have ventured to recommend for local authorities—come to terms with a respectable local company if possible, and so save the public money while safeguarding the ratepayers' rights. It is important that the agreement should be made with a local company; because if terms are made with any of the general companies that are going about in search of the nearest English equivalents for "concessions" for electric lighting, these will only try to float local companies for taking over their obligations, and the local authority will then be in the position of only being able to deal at second-hand with the real undertakers. As we have repeatedly said, many local authorities are simply frightened into applying for Electric Lighting Orders through the fear, which we believe to be exaggerated, of seeing a private company endowed with statutory powers over their streets. This is the merest bugbear, especially under the protection given to local authorities by the Electric Lighting Acts; and there is every probability that corporations driven into electric lighting by their fear or jealousy of joint-stock enterprise, will discover when it is too late that they have run from an imaginary trouble into a real one. To go into such an enterprise as electric lighting in confidence of the issue, and with a real faith in the public utility of the project, is a very different thing from taking it up timidly and half-heartedly because somebody else shall not have the chance. It needs a great deal of enthusiasm to cause a new and difficult business to "go" properly, as early pioneers of gas lighting found. Electric lighting is not to be made a success in any other way.

The paper on the distribution of electricity in Chelsea by means of accumulators, which Major-General Webber read before the British Association, contains some interesting reading for engineers who have gone through, in connection with gas, many of the difficulties and troubles which electricians are now experiencing in the attempt to reduce their work to the routine of a settled business. The system of electrical distribution adopted at Chelsea is a peculiar one; and the fact that it does not find imitation, means, we are afraid, that it is regarded as too complicated, or expensive, or both. This is an impression that cannot fail to be strengthened on perusal of General Webber's paper. He and his colleagues, to do them credit, have been anxious to make a good job of their work; but whether it can ever pay to fit up an electric light undertaking after such a fashion, is another consideration. It is curious to see that the fittings troubles of gas suppliers are repeated in the experience of their modern rivals. General Webber states that but for the action of the Fire Insurance Companies and the Board of Trade, the desire for cheapness in the matter of internal wiring which possesses many consumers, would lead to as bad work in this as anything that has been done in the case of gas-fittings. The Chelsea Company have kept aloof from internal wiring work, just as the early gas companies did from house fitting; but they have tried to guide their customers by issuing standard specifications which any electrical fitters can understand. General Webber admits that the only advantages the electric light companies can offer to the public in compensation for the admittedly higher cost of electrical fittings and electric lighting, are those of superior healthiness and comfort. As to this, however, he confesses that the competition of cheaper illuminants is a serious matter, and that people are apt to be indifferent to the question of health so long as the danger is not more apparent than in connection with the use of lighting-oils and gas. Then there is the drawback that the rules and regulations imposed on electric light installations, although salutary, hamper the industry at first, especially as rival lights are not subject to anything of the kind. Meters are used in Chelsea; but these appear to be cumbersome affairs, the Aron machine being 2 ft. 5 in. long by 15 in. wide and 8 in. deep, and they must be costly. General Webber makes a point against the patrons of the rival, or alternating transformer system, by declaring that the necessity for fixing transformers in houses is likely to prove a serious hindrance to the popularity of this system. In very few houses, he asserts, is a chamber to be found suitable for the reception of a transformer of the ordinary size; and the fitting-up of such an appliance entails an expenditure much in excess of its actual cost. How true it is that if one wants to learn the weak points of a manufactured article, one must apply to the manufacturer of a competing commodity! It should be stated that the latest estimate for a low pressure supply plant, with accumulators, on the Chelsea plan, is 30s. per lamp for not less than 30,000 lamps of 30 watts each. The Chelsea plant is for 9000 lamps only; and has cost 40s. per lamp.

Coal Tar Preservative for Iron and Steel.—The subject matter of a recent patent, taken out by Mr. J. H. Eastman, of Liverpool, is the freeing of gas tar from "ammonia and certain acids" which militate against its employment as a preservative coating. This is done by agitating it, heated to about 100° Fahr., with water and calcium sulphate in the proportion of 20 gallons of water and 10 lbs. of calcium sulphate to 100 gallons of tar. The phenols form lime compounds; and the ammonia yields sulphate of ammonia. The former are recovered by acidulating with sulphuric acid, and extracting with light tar oils, and purified by re-solution in caustic soda, removal of the neutral oils, and re-precipitation by sulphuric acid; the latter is obtained from its aqueous solution by evaporation. The purified tar is mixed with one-tenth of its bulk of light petroleum, or coal tar naphtha, and can then be used as a preservative material for iron and steel.

THE PERMANENT EXHIBITION OF GAS APPLIANCES IN BRUSSELS.

The Belgian Association of Gas Engineers and Managers have lately issued a pamphlet containing the report of the Committee of the Association who have the supervision of the permanent exhibition of gas appliances which was opened in Brussels some time ago, together with other documents bearing upon their work in connection therewith. The expenses of the exhibition (which is excellently situated in one of the principal thoroughfares) are defrayed by contributions from various gas undertakings. In the year ending Feb. 28 last the amount received was 18,969 frs., of which 16,502 were spent; leaving a balance of 2467 frs. The Municipality gave 10,000 frs.; the Imperial Continental Gas Association, 3000 frs.; the Belgian Gas Association, 2000 frs.; the St. Josse-ten-Noode Gas Company, 2000 frs.; and the General Gas Company of Brussels, 1000 frs. The number of exhibitors, which was 32 in the year 1887-8, rose to 40 in 1888-9; the exhibits increasing from 214 to 353. They comprised 96 burners and lamps of various types, 172 cooking and heating appliances, 11 regulators, 8 meters, 5 gas-engines, 35 miscellaneous articles used in connection with lighting and heating by gas, and 26 coke-stoves. The number of visitors to the exhibition during the twelve months was 58,760, or an average of 161 per diem. Large though it is, this figure is exclusive of the attendance at the various conferences held by the Association on matters immediately bearing on the object of the exhibition. The principal business done last year was the sale of 423 gas appliances (270 being cookers), the value of which is put down at 9080 frs. Of this sum 4975 frs. came from consumers of the Muncipality's gas, 1780 frs. from those supplied by the St. Josse-ten-Noode Company, 898 frs. from customers of the Imperial Continental Gas Association, 1255 frs. from the provinces, and 172 frs. from abroad. It is quite possible that the foregoing statement does not comprise the whole of the sales effected; for many of the visitors to the exhibition, after obtaining from the attendants all the information they require, apply to the makers of the stoves or other apparatus needed, and purchase of them direct. The appliances submitted for exhibition are tested by two or three experts. The Committee, however, being desirous of ascertaining the exact working capacity of the different cooking appliances, had a number of important experiments carried out therewith; and the tabulated results, with photographs of the stoves, are included in the report. These trials were conducted under the supervision of M. Richard, the Municipal Chemist, who appears to be a very valuable *collaborateur* of the Committee. His discourses on the subject of the application of gas for cooking and heating, as well as for lighting purposes, have been noticed by the local press, which also gives publicity to his articles dealing with such useful subjects as the value of gas coke as a heating agent. The last, but by no means the least important, matter to be mentioned in connection with the Committee's labours is the series of lectures on cooking by gas which they arranged to be delivered about Christmas last by Madame Alting-Mees. These lectures and their accompanying demonstrations were favourably commented upon in the public prints; and the idea was taken up and followed in several other towns, with undoubtedly beneficial results. The *Bulletin* of the Belgian Association, which we have here shortly noticed, presents a record of some really good work in a direction which must inevitably lead to the advancement of the gas industry.

Mr. Edison's Latest Promise.—It is said that Mr. Edison, during his recent visit to London, promised that he would shortly place on the market an incandescent lamp which could be retailed at less than one-half the price of the present lamps. He also affirmed that, for the same expenditure of watts per candle-power, it gives 25 per cent. more light.

The Recovery of Tar and Ammonia in the Manufacture of Coke.—A recent number of *Stahl und Eisen* lays stress upon the great progress that has been made in the plant for condensing the tar and ammonia formed in the manufacture of coke, while it has been found that by condensing it, the quality of the coke has not deteriorated. The Hoffmann-Otto ovens have proved excellent; and bee-hive ovens have also been used. In the water condensers not only the fluid tar but also much viscid tar is deposited. It is thus advisable to make use first of all of air condensers, which consist of large chambers with sheet-metal partitions, between which the gases have to travel zig-zag, and thus deposit most of the tar and coal dust. After leaving the water-condensers, the gases are passed through washers, to remove the remainder of the tarry products. Since only 11 to 14 per cent. of the nitrogen in the coal is converted into ammonia, numerous attempts have been made to increase the yield. It has been proved in practice that, instead of being diminished, as hitherto supposed, the yield is increased by employing a higher temperature; and the introduction of hydrogen into the coke ovens still further increases the yield. As hydrogen is too expensive, dissociation of water in the ovens has been tried; but the loss of coke in consequence is too great. The use of lime is also unsatisfactory, as the quality of the coke is deteriorated. A greater yield of tar can be obtained by keeping the upper part of the ovens cool; but its quality is diminished owing to the decrease in the light oils. The tar is sent away for distillation; but the ammoniacal liquors are almost always worked up at the coke factories—generally into sulphate of ammonia.

GROVES AND THORP'S TECHNOLOGY—FUEL.*

The first thought that would occur to a technical student on obtaining a sight of the handsome and important-looking book which constitutes the first volume of Groves and Thorp's Technology, would be that it must be exactly the work he requires, first for study and then for reference. Here we have nearly 800 pages of close but clear print, with numerous illustrations, devoted to the immense subject of the application of fuel in modern arts and manufactures. It should be a monument to modern pyrology; and there can be no reason for excusing any faults or omissions that may be detected in the performance of the compilers. They have had space and means enough for the production of a truly magisterial work; and any one purchasing it must naturally expect to find in its pages all that a book can contain of the subject to which it is devoted. It is, as the authors tell us, the first of a new edition of Chemical Technology, founded on the early work of Richardson and Ronalds, and subsequently improved by Richardson and Watts into the form familiar to every student. The appearance of a new and enlarged edition of this indispensable work, is an event of no small importance in the world of chemical industry; and we are desirous of duly recognizing this fact, and of impressing our readers with its interest for themselves, before saying anything about the way in which the new edition has been written. Having thus made our acknowledgment of the fact that the book now before us is no mere fugitive production, but ranks as a veritable and accepted encyclopædia, we may proceed to state what it contains.

There is, to begin with, an introductory chapter explanatory of the branches of manufacture connected with the production of fuel and the process of combustion. Here we find a statement of what is meant by "fuel," with a list of the substances to which the descriptive term is applied, which naturally leads to analytical classifications of the quality of combustibles. Wood, being the basis of all industrial fuels, comes in for much attention; and the student is then led through some pages on peat to the consideration of coal. The nature and quality of coal is treated geologically, mineralogically, chemically, and microscopically. Many pages of tables and diagrams are occupied with this matter. Then we find descriptions of coal mining, charcoal burning, coke making, and, in short, everything connected with the preparation of commercial fuels for the purposes for which they are utilized. Coke, in particular, is dealt with at great length; and blast-furnace practice is well explained from the pyrological standpoint. The history and use of converters and gas producers of all kinds occupies a considerable space; but we could have wished that the writer of this part of the book had shown a little more method in arranging his matter. As it is, though Kidd precedes Lowe and Strong, as is only natural, he is widely separated from Dowson; and Wilson actually precedes Tessié du Motay. The matter is here; but it is difficult to follow the order of arrangement, if there is any.

Natural gas and liquid fuel have their turns; and oil gas and "minor fuels," principally carbonaceous refuse, bring to an end the section of the book devoted to the nature and qualities of fuels, which occupies upwards of 300 pages. Next comes the section devoted to calorimetry, pyrometry, heat, and flame. The industrial application of the materials and principles previously described and enunciated occupies the latter half of the book. The writers are generally content to describe processes and apparatus without undertaking to criticize them. Gas fires and heating and cooking stoves are fairly noticed; and a good deal of information is here condensed that must otherwise be sought up and down through the pages of old volumes of the Journal, where much of it first appeared. Heating by hot air and hot water is discussed; and then we get to steam generation, boiler performances, &c., which occupy a considerable number of pages. All this part of the book is calculated to be of the greatest assistance to the student of pyrology, seeing that it takes in the questions of mechanical stoking, gas-firing, chimney efficiency, forced draught, and a host of minor considerations. The heating of gas-retorts is treated in several pages; and if the professed gas engineer would not derive much information from these passages, they serve as a succinct record of what has been done in this respect during the past ten years. More useful matter might have been compressed into the same space, if the compiler had devoted less attention to systems that have only had ephemeral success. It might be argued on the other hand, however, that it is just such systems that a chronicler of technology should take most careful note of; for these are the arrangements that get invented over and over again when people have forgotten their details. The book ends with tables of coal analyses, and a good index. Altogether, it can be recommended as a necessary for the reference library of every fuel user on a large scale. If it does not embrace every detail that a chemist or manufacturer expert in some special branch of technology could suggest, it contains much that is likely to be useful to all fuel users which could not be found in any other book. We have nothing to complain of when the writers undertake to discuss points of the utilization of coal gas for heating or cooking; indeed, the writer who recommends gas-stoves in connection with the prevention of smoke, does so in words that indicate his competence to deal with the subject. We shall look forward with interest to the appearance of the next volume of the series, which is to be on "Lighting."

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* Chemical Technology, or Chemistry in its Applications to Arts and Manufactures. Edited by Charles Edward Groves, F.R.S., and William Thorp, B.Sc. Vol. I. Fuel and its Applications, by E. J. Mills, D.Sc., F.R.S., and F. J. Rowan, C.E. London: J. and A. Churchill.

WATER ACTS FOR 1889.

The following are the Acts of Parliament relating to water supply which became law last session: The Garw Water Act incorporates a Company with a capital of £50,000, and power to borrow £12,500, for the purpose of acquiring and extending the water undertaking of the Garw Water and Light Company in the county of Glamorgan. The said undertaking is to be purchased within nine months after the passing of the Act for the sum of £5000. The additional works authorized consist of sundry weirs across streams in the parishes of Bettws and Llangeinor and Llandyfodwg, with limitation to take only one-half of the quantity of water flowing at any time; a period of 15 years being allowed for the execution of the works. Rates for domestic supply are to range from 7½ to 6 per cent. The Kettering Water-Works Act dissolves a limited Company, and re-incorporates the members with a capital of £70,000, whereof £50,000 is additional capital to be raised under the Act. The sum of £5000 may be borrowed in respect of the old capital, whereof £4500 is already raised; and £12,500 may be raised on loan in respect of the new capital. Additional works, comprising an embankment across the Cransley Brook and a pumping station, are authorized to be constructed within 7 and 10 years for different sections thereof. Compensation water is to be allowed to flow down the said stream at the rate of not less than 300,000 gallons daily. Rates for domestic supply range from 10 to 7½ per cent. on the rental, with the former rate for inns. The East Kent District Water Act incorporates a Company with a capital of £40,000, and power to borrow £10,000, for the supply of a district round Sandwich and St. Margaret's-at-Cliffe. The source of supply is a well and pumping station in the parish of East Langdon; and the works are to be completed within 5 years. Rates for domestic supply vary from 7½ to 5 per cent. The Rastrick Water-Works Act dissolves and reincorporates a Company with a capital of £6000 original stock and £9000 additional, with power to borrow £2000 in respect of the original, and £2250 on the additional capital, for the purpose of supplying the district under the control of the Local Board of Rastrick. The statutory powers of the Corporation of Halifax to supply water within the same district are repealed. An additional reservoir is to be constructed within five years. The Company are forbidden to take compulsorily more than ten houses occupied by labouring people. Rates for domestic supply are to range from 8 to 6 per cent., with 10 per cent. for inns. The undertaking is to be sold on requisition to the Rastrick Local Board at any time before 1891 at the agreed price of £15,250, upon certain stipulated conditions. Power to acquire the undertaking is also conferred upon the Local Board. The South Kent Water Act incorporates a Company with a capital of £52,000, and power to borrow £13,000, for the supply of a district round Hawkhurst, and near Tunbridge Wells. A well and pumping station are to be constructed in the parish of East Peckham within five years. Rates vary from 7½ to 5 per cent. The Stapleford and Sandiacre Water Act incorporates a Company with a capital of £16,000, and power to borrow £4000. Works, comprising a well and pumping station in the parish of Sawley, are to be constructed within five years. Rates will vary from 12 to 6 per cent. The Woodhall Spa (Gas and Water Act) incorporates a Company with power to raise £12,500 of water capital, to be applied as in a distinct undertaking, with £2500 of loan capital. The Company have made an agreement with the Horncastle Water Company, which is scheduled, and also with the private owner of certain existing water-works in the district. Rates for domestic supply range from 8½ to 6 per cent.

The Barry and Cadoxton Gas and Water Act contains clauses enabling the Company to increase their water capital by £12,800, with power to borrow £3200, for the extension of their works by the construction of certain new wells, &c., to be completed within five years. The Bristol Water-Works Act enables the Company to raise £100,000 of new capital and to borrow £25,000 in respect of the same. Certain works authorized by their Act of 1888, consisting of a pumping station and three pipe lines, are to be abandoned on paying compensation to landowners and occupiers. New works are authorized, comprising an embankment across the valley of the River Yeo, and subsidiary works, allowing a daily flow of 1,900,000 gallons as compensation water. It is enacted that the Company shall provide and maintain a "suitable mechanical instrument" for recording this flow of water. These works are to be completed within seven years. The Cleveland Water-Works Act recites that owing to the depreciation of the value of property within the Company's limits of supply, their authorized charges have become unremunerative; and they are consequently empowered to charge 4s. each for waterclosets and baths in houses of less than £10 annual value; and are not to be required to supply water for domestic purposes to any house for less than 8s. 8d. per annum, exclusive of any such extra as aforesaid. The Devonport Water-Works Act changes the name of the Company from that of the Company of Proprietors of the Plymouth Dock Water-Works to that of the Devonport Water Company; and enables them to raise £80,000 of new capital, with power to borrow one-fourth of the sum raised from time to time. The works are to be enlarged, under the sanction of the War Secretary, within seven years. The Eastbourne Water-Works Act enables the Company to increase their capital by £100,000, with power to borrow one-fourth part of the sum raised from time to time. New reservoirs are to be constructed within ten years. The Newcastle and Gateshead Water-Works Act authorizes the increase of the Company's capital by £500,000, with power to borrow £125,000. Two new reservoirs with the necessary subsidiary works are to be completed in ten years. A fish pass is to be constructed round the embankment on the River Rede, down which 4½ million gallons of water are to be discharged daily during the months of February, March, and April, and 2 million gallons daily for the rest of the year. The regulation as to high-level supply in Gateshead is modified. The stock of water to be maintained in the reservoirs during the months of July, August, September, and October is stated; and deficiencies are to be made good by pumping from the Tyne. No supply of water by the Company to the North Shields Water Company is permitted unless the reservoirs contain a store of 500 million gallons day by day between the first of May and the end of September. The Yeadon Water-Works Act extends the Company's limits of supply; and authorizes the raising of £28,000 in new shares, and the borrowing of £7000 in respect of the same. New works are to be constructed within seven years, comprising an impounding reservoir discharging compensation water at the rate of 148,750 gallons of water daily. With respect to the rates for domestic supply, it is enacted that a new schedule shall come into force as soon as the Company shall have expended £7000 on the newly authorized works, provided also that the reservoir is completed within four years. The Windermere District Gas and Water Act enables the Company to raise £15,000 further water capital, with power to borrow to one-fourth of the amount as raised. Additional water-works, comprising an extension of an existing reservoir and the construction of a new one, are sanctioned; some of them to be finished within five, and others within fifteen years.

The following Acts relating to water supply were obtained by public authorities: The Belfast Water Act enables the Belfast Water Commissioners to construct works for the filtration of the water supply of the town, taking also some additional streams. The time for completing certain works authorized by the Act of 1884 is extended. Provisions relating to compensation water are inserted. The lands required for the new works are to be acquired within five years, and the works completed within ten years. The qualifications of Commissioners and electors are defined. Borrowing powers to the extent of £170,000 are conferred on the Commissioners, with the usual provisions as to sinking fund. Power is also conferred for the creation of redeemable water stock. A sum not exceeding £30,000 may be expended on new mains and fittings. Skating on the reservoirs is to be prohibited. A charge of 10s. per annum may be made for plumbers' licences. The name of the Commissioners is changed to that of the Belfast City and District Water Commissioners. Complaints of unwholesome water are to be made in writing to the Local Government Board for Ireland. The Bury Corporation Water-Works Act authorizes the Corporation to extend their water-works by the construction of an impounding reservoir on the Whitewell Brook, allowing as compensation water a flow of 2 cubic feet per second during the twelve working hours of every day. The Corporation undertake to bear all responsibility for, and make good any damage that may occur from failure of the reservoir dam. The necessary lands are to be acquired within five years, and the works completed within ten years from the passing of the Act. The Corporation are under obligation to supply the district of Haslingden within a period of five years. The sum of £130,000 is to be borrowed for 60 years for water-works purposes. The Coventry Water Act empowers the Corporation to construct additional wells and other works for the enlargement of their water undertakings; the whole to be completed in ten years. The necessary lands are to be acquired within three years. Existing regulations relating to water-rates are modified. The sum of £100,000 is to be raised for water-works purposes. The Deanhead Commissioners Act enables the Commissioners to supply water to the Local Board of Stainland, and construct the necessary works for this purpose. The works are to be completed within five years. The Commissioners are empowered to borrow £9000, and to contract for the sale of water in bulk. The Edinburgh and District Water-Works Act enables the Trustees so named to borrow £50,000. The Heywood Corporation Act extends the limit fixed by the Act of 1877 for the construction of a reservoir to ten years from the passing of the Act, and authorizes the borrowing of £25,000 for the enlargement of the Naden reservoir. The Hythe Corporation Act enables the Corporation to acquire a piece of land, and to borrow further sums of money for water-works purposes; the amount to be determined by the Local Government Board. The Liverpool Corporation Act enables the Corporation to make bye-laws for preventing the waste of water, and creates as an offence the forging or counterfeiting of any Corporation stamp or mark, or the use of anything so marked, with knowledge of the forgery, which is punishable with a fine of £20. The Manchester Corporation Act enables the Corporation to acquire additional lands at Longdendale for the purposes of their water undertaking, and to construct works. A form of certificate of the existence of annuitants is scheduled for the protection of the Corporation. The Newry Improvement Act enables the Commissioners to raise £110,000 on the security of any or all of their rates and funds, creating debenture stock if so disposed. The Commissioners are also authorized to make regulations for preventing waste of water, and to license plumbers. The Padiham Local Board Act authorizes the construction of additional water-works, comprising a compensation reservoir situated on Woodhouse Brook, and various subsidiary works, to be completed within seven years. Compensation water at the rate of 115,800 gallons per 24 hours is to be discharged down the impounded water channel. Power is given to borrow £50,000 for water-works

purposes. The Swansea Corporation Act extends to seven years the period for the completion of the Lliw reservoir embankment, and enables the Corporation to borrow £7400 to defray the costs of legal proceedings taken against them in consequence of their failure to discharge compensation water and otherwise in connection with the collapse of the Lliw reservoir; also the sum of £5100 for the cost of providing temporary sources of supply. The Wakefield Corporation Act extends to ten years the period fixed for the completion of certain authorized reservoirs, and sanctions the construction of other works to be completed within ten years. The provisions as to compensation water are revised. Power is given to borrow £170,000 for water-works purposes. Lastly, the Wigan Corporation Act authorizes the creation of stock; and enables the Corporation to acquire additional water by agreement.

THE PRICE OF GAS AT TOKIO.—In the paragraph on this subject in the JOURNAL last week (p. 686), the English equivalent of the present price of gas at Tokio was given as 3s. 2d., instead of 6s. 2d. The value of the yen may be put at 4s. English; but, at the present rate of exchange, it is worth about 8s. 1d. The Tokio Company are now, as we stated, charging 2 yen (say, 6s. 2d.) per 1000 cubic feet, which is a very low figure for an Eastern company.

THE DANGER OF OVERHEAD ELECTRIC WIRES.—A Central News telegram from New York, dated Saturday, says: Yesterday a lineman was killed while attending to an overhead electric light wire. No one could reach the man for over an hour; and during that time some thousands of persons watched the horrifying spectacle. The body was slowly burnt, the clothing smouldered, and sparks were clearly seen from the street below. Public feeling has been roused to a high pitch over the numerous deaths from contact with electric light wires.

MIDLAND ASSOCIATION OF GAS MANAGERS.—The thirty-fourth general meeting of this Association will be held at the Grand Hotel, Birmingham, next Thursday, under the presidency of Mr. C. Taylor, of Derby. According to the circular issued by the Honorary Secretary (Mr. J. S. Reeves, of Bilston), the principal items of business will consist of the discussion of the papers read by Mr. J. F. Bell and Mr. W. T. Tew (on "Water Gas" and on "Unaccounted-for Gas" respectively) at the spring meeting of the Association. Officers for the ensuing year will be elected; and at the close of the business the members will inspect the works of the Compressed Air Power Company. In the afternoon there will be the usual dinner.

ELECTRIC LIGHTING IN BRUSSELS.—According to the local correspondent of *Industries*, the result of the invitations recently issued by the Town Council of Brussels for schemes for the introduction of the electric light throughout the town, is that six firms have submitted plans. These comprise some of the well-known systems; but amongst them is one which is novel. This plan has been prepared by M. Van Rysselberghe, known as the inventor of the long-distance telephone system. He proposes to distribute not electric current but hydraulic power; and to generate the current by means of hydraulic motors placed on the premises of the subscribers. The cost of having the current from a distance to the point of consumption, in the case of the Théatre de la Monnaie, enormously increased the total expense of the installation. In this case the current is furnished by the gas-works at Laeken; and the whole installation has cost about 180,000 frs., whereas a local plant could have been put up for 20,000 frs. According to M. Van Rysselberghe's present project, large pumping stations would be erected outside Brussels; and water, under a pressure of 750 lbs., would be conveyed by means of various sub-centres, where small local generating plant would be established.

THE TEMPERATURE OF DEEP OIL AND GAS WELLS.—In the course of the report presented at the recent meeting of the British Association by the Committee on Underground Temperatures, it was stated that the Secretary (Professor Everett) had been in correspondence with Mr. G. Westinghouse, jun., of Pittsburg, President of the Philadelphia Company, with the view of obtaining observations of temperature from some of the deep oil and gas wells belonging to the Company. Mr. Westinghouse entrusted the observations to Mr. A. Cummins, the Company's Mining Engineer and Geologist. Some attempts were made at observation; but, owing to press of business, they were not thoroughly carried out. The most successful attempt was made in a well at Homewood, in the city of Pittsburg, known as the Dilworth well, where the following results were obtained:—At a depth of 3600 feet, the temperature was 96° Fahr.; the air at the surface being 70° Fahr. At 3710 feet the temperature was 89°; air at surface, 76°. Going deeper, we have the following figures:—3920 feet, 102°; 4002 feet, 108°; 4215 feet, 111°; 4295 feet, 114°—the air temperature being respectively 60° in the first case and 62° in the rest. The thermometer remained only from five to ten minutes during each test; and as there were only 40 feet of water in the well, the observations must have been taken in air. The diameter of the well was 6 inches. The mean air temperature at Pittsburg is 52° Fahr.; and the height above sea-level about 900 feet. Comparison of the mean surface temperature (taken as 52°) with the temperature of 114° recorded at 4295 feet shows an increase of 62°, which is at the rate of 1° Fahr. for 69·3 feet. But comparisons of the observations *inter se* would give a rate about twice as rapid as this; hence no safe conclusion can be drawn. Mr. Cummins hopes shortly to get the temperature of some deep wells in a way that will be satisfactory.

Notes.

GAS LIGHTING AND NIGHT CLOUDS.

Is the average amount of the light that falls on the pavements and roadways of a gas-lighted town affected by the circumstance of the sky being cloudy or clear and moonless? The question arises out of some observations addressed to *Nature* by Mr. John Le Conté, of Berkeley, California, on the possibility of clouds being self-luminous. It is remarked that on most cloudy nights there is a faint diffused light in the sky which enables wayfarers to find their road, although frequently the glow is so faint that it is only possible to observe it at a distance from cities and large towns, in places where the air is free from smoke, and where the darkness of the sky is not affected by the general illumination due to gas and electric lights. However dark the sky may be, it is very different from the Cimmerian darkness of a cavern. It is stated as the popular opinion that the clouds act like ground-glass lamp-globes in diffusing the aggregate starlight, so as to produce a faint illumination from all parts of the sky, and thus obliterate shadows on the surface of the earth due to the greater amount of light radiated from the more luminous regions of the celestial vault. But Arago reasonably maintained that when we consider the immense effect of clouds in weakening the dazzling light of the sun on particular days in winter, it is scarcely possible to admit that the faint diffused light which on a cloudy night guides the steps of the traveller, passes through the clouds. In other words, in view of the loss from reflection and absorption, the amount of starlight that penetrates the cloud canopy seems to be inadequate to account for the degree of general illumination observed at the surface of the earth. Consequently, it appears that the clouds themselves must be luminous. Near towns, the artificial illumination alters the natural appearance of night clouds, and their exceptional brightness has been traced to reflection of gaslights in the water drops held in the clouds. The phenomenon requires to be further examined.

ELECTRICAL AND PHYSICAL STANDARDS.

There is much uncertainty, not to say confusion, among modern physicists respecting the standards of light, electricity, work, &c., which shall be recognized internationally. The Congress of Electricians met in Paris recently and agreed upon certain units, and the names whereby these should be known, which are substantially the same as those recommended in the report of the British Association Committee on Electrical Standards. These are the "joule" as the name of the practical unit of work, which is the energy expended during one second by a current of one ampere when traversing a resistance of one ohm. The name of the practical unit of power is the "watt," which is the rate of working of a machine performing one joule per second. The power of a machine could naturally be expressed in kilo-watts instead of in horse power. The name of the practical unit of light intensity is the "candle," which is the twentieth part of the absolute standard of light (one Violle unit) as defined by the International Congress of 1884. This is very nearly the value of a parliamentary standard candle, which has been computed to stand to the Violle unit in the ratio of 1 : 19·665; but the two have never been directly compared. Following the electricians, the professors of applied mechanics have had a congress in Paris, at which they agreed that certain words commonly used in mechanics should henceforward possess definite meanings. Thus the word "force" means effort, and has the kilogramme for its unit. "Work" means force combined with direction, and has for unit the kilogrammetre. "Power" means work combined with the time element, and may have for unit either the (French) horse power of 75 kgm. per second, or the "poncelet" of 100 kgm. per second. The word "energy" is stated to be only a generalization. M. Mascart observes upon this statement that the proposed strange unit of power, the "poncelet," conflicts with the kilo-watt which the electricians had already wished to constitute the unit of power for the world. The "poncelet" differs from the kilo-watt by about 2 per cent. in the latitude of Paris; and there can be no necessity for two units of so nearly like value. Meanwhile, the old English unit of power and the English horse power continue, to be used more than any of their fancy substitutes.

THE COLOUR OF DAYLIGHT.

The question of the colour of natural daylight is raised by M. Crova in the course of a communication to the Académie des Sciences relative to some observations on the diffused light of the sky made by means of the author's spectro-photometer. The theory of atmospheric diffusion and the phenomenon of diffraction which gives rise to the blue colour of the sky, have been the object of the researches of many physicists whom M. Crova names. Some have studied the blue of the sky by polarization methods, and others by spectroscopic means. M. Crova has adopted the latter plan. He has found, by the employment of a suitably modified form of his instrument, that the diffused light of the sky contains a preponderance of the most refrangible rays in the morning. This ceases towards the middle of the day, to reappear in the afternoon, but not always to the same degree for the corresponding hours before noon. The diffused light of the blue sky is much more blue than that of the sun, although the latter is blue rather than white. Even when the sky is cloudy, the light derived from it has much analogy to that of the blue sky. It is less blue than the latter, but still it is more blue than that of the sun. According to this statement, it is a mistake to speak of cloud light or any other variety of natural daylight as white. It is all blue; containing at all times a large proportion of refrangible rays.

Technical Record.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Discussion on Mr. Cox's Paper on "Gas Popularization."

In the JOURNAL last week (p. 695) we gave, in connection with our report of the half-yearly meeting of the above-named Association, held at Doncaster on the 4th inst., the interesting paper on "Gas Popularization," read by Mr. J. H. Cox, jun., of Sunderland. Owing to the crowded state of our columns, we were compelled to defer the publication of our report of the discussion which took place thereon; and we complete our record of the proceedings by giving it to-day.

Mr. H. TOBEY (Malton) said he was very pleased with the paper, of which the Association ought to be proud. As to the popularization of gas, they would all, no doubt, think they had done a great deal if they could offer it to their consumers at the price mentioned in the paper—1s. 8d. per 1000 cubic feet. If they could do this, most of them would think they had nothing more to do to make it popular. However, Mr. Cox was not satisfied with supplying it at that rate, but sought further means of making it more popular. The steps he wished to take were somewhat extraordinary; for though there had been various schemes devised for popularizing gas, none was to be compared with this. It would certainly be a new departure to have an elaborate system of inspectors and chief inspectors going about among the consumers, showing them how to burn gas and use it to the best advantage. Mr. Cox's contention, as he (Mr. Tobey) gathered, was that at present only about 66⅔ per cent. of the lighting power was obtained from the gas; and that if the consumer were put in the right way, he might get 50 per cent. more duty from the gas. If this were so, it would be a great advantage to the consumer; but that it would be an equal advantage to the gas companies, he was hardly prepared to admit. In the first place, if the consumer obtained 50 per cent. more light or heat from the same quantity of gas, there would be at once a reduced consumption; and a production of 100 million cubic feet at a gas-works would be reduced to 66 to 70 millions. The gain to gas companies would not, therefore, be very apparent. They would be laying out a lot of money to benefit the consumer, and would not get anything in return for it. No doubt this effect would pass away in time; because, if they showed the consumer how to burn gas economically, he would get a much cheaper light, and would probably employ it much more largely than he did at present, so that he would come back to the use of the same quantity of gas as before, and would most likely go on until he used 50 per cent. more than he did originally. He (Mr. Tobey) could not say anything as to ventilation; but he agreed with Mr. Cox that, in putting the electric light in buildings under the impression that it was a more healthy illuminant, people were getting something which was really not so healthy as gas in a properly ventilated building.

Mr. T. BOWER (West Hartlepool) said the paper was of such importance, and the diagrams and tables pertaining to it of so voluminous a character, that it was almost impossible to do justice to the subject in any discussion which might arise that day. Therefore it would have been better to have postponed the subject till another meeting, in order that they might have gone carefully into the matter with reference to their own localities. Personally, he was very much indebted to Mr. Cox for having placed on record the most valuable particulars contained in his paper, which would serve them so well for reference in future. In West Hartlepool they had not done a very great deal to popularize gas, though they had tried within the last year or two to do something. They had carried out, as far as they could, the idea which Mr. Cox had put forward with reference to the erection of show-rooms and the heating of the offices by gas. To a certain extent they had also done something with regard to ventilation, but not so much as he should have liked. They had found what they did had been of great service, for since the opening of the show-rooms, at which the public could see what could be done in the way of heating, lighting, and cooking, they had had a very considerable augmentation in the consumption of gas. Last year they had an increase of 6 or 7 million cubic feet, which, upon the quantity they made, was considered to be a fairly good result; while this year he should be surprised if the increase were not double the amount named. There were now some 600 or 700 stoves in use; several gas-engines were at work; and the Company had derived very considerable advantage from the letting out on hire of different cookers and other apparatus. His advice to the companies and corporations who had not tried this plan was to begin at once. He was not quite so sure that the system of inspection which Mr. Cox suggested, however well it might serve the purpose of educating the consumer and increasing the consumption of gas, would readily commend itself to boards of directors and committees of corporations. As many of them were aware by experience, suggestions of additional expense in the way of extra inspectors or anything else, were not always received by gas committees and directors in the spirit in which they were made by managers or engineers. He believed, however, that if committees and directors were a little more liberal in this respect, and a little more alive to the interests which engineers and managers had at heart, it would be better for the consumers and for the financial success of the undertakings. His Directors had met him fairly in this matter; and they would endeavour to further popularize gas as far as possible, because just now they had two companies making application for Provisional Orders, or asking the Corporation to apply for a Provisional Order to introduce the electric light into the town. The Corporation did not feel inclined to let any company come on their ground; and he believed they would make application for powers to supply the electric light themselves. This being so, the Gas Company would have greater competition than they had had hitherto; and no doubt the Directors, not only of his Company, but of all the companies throughout the North of England district, would be alive to the fact that it behoved them to look after their rights, and see that nothing was introduced, by those supplying electric light or anything else, which would interfere with the success of their undertakings. Mr. Cox had given them such information and hints as would, if carried out, enable them to stave off the competition of the electric light or any other competitor.

Mr. W. FORD (Stockton) remarked that if gas managers of the old school had more gentlemen like Mr. Cox, jun., in their neighbourhood, it would do them good, as they required to be stirred up a little. Mr. Cox had referred to one or two general principles which they should endeavour to induce their companies and corporations to carry out. One of these was ventilation. He had not hitherto been successful in this direction; but should now study with great care what Mr. Cox had said on the subject. Gas, no doubt, was open to objection if there was not efficient ventilation, and if rooms were continually filled with bad odours arising from the consumption of gas, it would lead to evil results. To attempt to educate the public on this subject would be a great service, not only to the people but to gas companies and committees. He saw only one difficulty in the way. It was well known that when the gas man went round, the belief was entertained that it was only to tell them something new to increase the gas bill. If they could only get rid of this feeling, and induce the people to put confidence in them, they would be able to do more good to the public. If Mr. Cox could recommend some means by which they could get at the people, it would be a great advantage, for at present the doors of their customers were nearly shut against them. If the public would only put confidence in them and say, "We will leave it to you and your staff; we expect economical results, and if we get these we will give you the credit," they would have a better field to work upon than they had now. In this respect the electricians were very much better off than gas managers. They would not let anyone interfere with them, but said, "We will lay down this installation ourselves, and will have no interference to the point of ignition." If gas managers had this privilege, gas would be consumed more economically, more efficiently, and under more healthy conditions. He therefore believed that if the recommendations of Mr. Cox could be carried out to even a small extent, it would result in great advantage to them as gas managers.

Mr. G. PETTIGREW (Gateshead), speaking as a consumer of gas, said he used the most modern apparatus it was possible to obtain, and did not find any such result as that to which Mr. Cox had referred. Mr. Cox alleged that by an intelligent use of gas, with modern appliances and efficient inspection, there would be a saving of 50 per cent.; but this was not his own experience.

Mr. D. M. NELSON (Glasgow), referring to the oft-repeated recommendation that cheap gas should be supplied, said that though it was undoubtedly possible to produce cheap gas, he did not think it wise to do so. Cheap gas meant nasty gas; and it could not possibly hold its own against the electric light. All gas companies should manufacture gas from the best coal they could get; and this should especially be the case when they were situated in localities where there was good cannel or shale. Unfortunately, they did not always do it, even in Scotland, where they were blessed with excellent cannel and shale fields. Where the gas was bad, it was no obstacle to the introduction of the electric light. The manufacture of oil had taught gas managers a lesson in respect to the advantage of supplying a good article. The paraffin oil of the present day was not like the petroleum or the paraffin of twenty or even ten years ago. There was no bad odour; and it was quite a treat to have in the house the refined oils now supplied. The largely extended use of oil showed that where an article was perfected in the manufacture, its use would be popularized, whether it was gas, electric light, or oil. Water gas he would not refer to, because he thought it too early to speak of it. It was not exactly before them yet, though for heating purposes it would be a strong rival of coal gas; while for metallurgical and other processes it would, no doubt, supplant other fuels. His point was that gas suppliers had a strong rival in the electric light; the new illuminant being now an established fact. It was therefore the duty of those interested in gas to manufacture it as perfectly and as pure as it could be made.

Mr. H. B. BURROWS (Liverpool) thought it a great pity that the ordinary gas-fitter and plumber could not be educated up to a full knowledge of his business. The gas consumer could not always turn to the gas company for information; and if they could only manage to so train the gas-fitter as to place him in a position to give it, they would do much to popularize gas.

Mr. Cox, replying to the different speakers, said that Mr. Tobey implied that it would not pay gas companies to undertake the special work which he had suggested, because with better knowledge the consumer would use less gas. He (Mr. Cox) did not believe that this would be the result. There had, from time immemorial, been a desire for more light, and people would not want to reduce their gas bills so much as to get better light from the gas they used. Mr. Bower seemed to have done a great deal to popularize gas; and his remarks did not call for particular comment. There was,

however, an old saying that the dividend was made or lost in the retort-house; and so, it seemed to him, it might be said that the consumer would be gained or lost at the burner. Therefore he thought they should broaden their investigations, and help the consumer to the burner. This, as Mr. Ford had pointed out, was only what the electricians did; and if they could afford to do it, surely it would pay gas companies and their managers. It was true, no doubt, that householders did not care much for gas men; but, after all, householders were sensible people. When gas supply was a monopoly, they possibly had cause not to place confidence in the gas man; but now that it was a question of the best light winning, it was not a case for suspicion. Besides, there were portable appliances which they could take round to demonstrate the truth of their statements; and if they put improved burners in the place of old and inferior ones, the householder would see the advantage. Mr. Pettigrew had told them that he did everything which the paper recommended, but could not find 50 per cent. efficient increase. It would be interesting to know what kind of burner he started with. If they looked at Table II. (*ante*, p. 697), in which were given the different results obtained from 16-candle gas under various conditions, they would see that in one case the duty obtained was only 3¾ candles. Would anyone say there was no room for improvement there? The average of 18 good and bad burners was 11½ candles; and with the Wenham lamp it was 22 candles, or nearly 100 per cent. above the average. He therefore held that he was quite justified in saying that, with the co-operation of the gas company and the consumer, it was easy to give the latter an average advantage of 50 per cent. It was dangerous for Mr. Nelson to come to England and say they must make cannel gas. They simply couldnot do it there.

Mr. Nelson: I said, use the best coal in the district.

Mr. Cox replied that most gas companies did that, and most certainly they could not make cannel gas. Scotch cannel gas was very expensive, and he had himself visited Scotch towns where the gas was very much worse than in some English ones. He supposed every gas manager made the best gas he could, and the gas which he believed would best suit his customers. The remarks of Mr. Burrows bore out that which he had contended for. Mr. Burrows appeared to have been asking, or knew someone who had asked, the gas inspector for information. This showed that consumers were anxious for information; and he believed it would pay gas companies to give it to them.

The prospective arrangements for the coming session of the Society of Chemical Industry include the reading of a paper, on Dec. 2, entitled "Some Notes on Variations in the Products of the Destructive Distillation of different Gas Coals, heated separately in the same Retort and under Similar Conditions." The author will be Mr. Watson Smith, the Editor of the Society's *Journal*.

An accident of a somewhat serious character has happened to the Chairman of the Southwark and Vauxhall Water-Works Company (Alderman Sir Henry E. Knight). He was returning from the United States the week before last, on board the steamship *Umbria*, when he fell down some steps leading to one of the decks during a gale, and cut his head severely, besides sustaining concussion. He was unconscious for some time, and was with difficulty removed ashore, and afterwards brought to London.

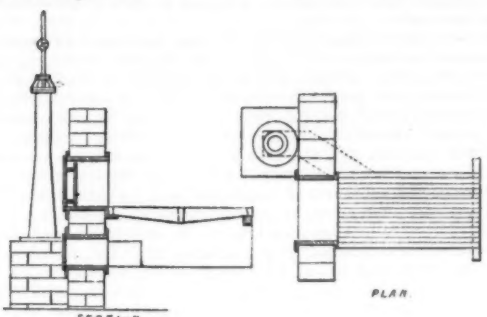
Frequenters of the Committee-room corridors of the Houses of Parliament will miss next session one whose striking presence has long been known in connection with some of the most stirring fights over Private Bills during the past half century. Mr. Robert Baxter, of the firm of Baxters and Co. (formerly Baxter, Rose, and Norton), died last Tuesday at the age of 87. During his lengthened career as a Parliamentary Agent, Mr. Baxter won many admiring friends, who placed implicit confidence in the ripe judgment of the deceased gentleman.

In Mr. W. J. Dibdin's report to the London County Council on the quality of the gas supplied to the Metropolis during the week ending the 28th ult., four cases are recorded of gas being below the standard; The Gaslight and Coke Company being in all instances the defaulters. Three cases occurred at the Nine Elms testing-place, where the gas on the 23rd, 25th, and 26th ult. was found by the Examiner to have only 15·9 candles illuminating power; the other being at Camden Town, where 15·7 candles was recorded on the 25th ult. In the report for the week ending the 5th inst., the illuminating power of the South Metropolitan Company's gas, as tested at the Blackfriars station, is given as 15·6 candles on the 4th, and 15·8 candles on the following day.

Some years since we abstracted from a foreign source a description of the employment of sugar as a remedy for incrustations in steam-boilers using dirty or surface waters. Our paragraph on the subject was borrowed without acknowledgment, as frequently happens, by an American publication, which took the credit of disseminating the information. Recently the same journal published a communication from a steam-power user of Indiana, who states that he tried the remedy with such success that he has used it ever since. His feed water is from a well, and is described as excessively bad, and the boiler was very old. With the use of 3 lbs. of brown sugar and a handful of washing soda, the scale was softened in four weeks and rendered easily removable. The same thing was proved in the case of a new tubular steel boiler. Most of the solid matter accumulated above the furnace; and there was a thin deposit wherever the water touched. The addition of sugar, however, rendered the scale harmless; leaving the metal beneath clean and as good as new.

A SIMPLE BREEZE OR DUST FURNACE.

In our report of the proceedings at the recent meeting of the Eastern Counties Gas Managers' Association (*ante*, p. 598), it was mentioned that Mr. W. Drewry, of Cleethorpes, had sent a drawing and short description of a simple breeze or dust furnace which he has in use at his works. As Mr. Drewry had intimated his intention of contributing a paper at the next meeting of the Association, his short communication was taken as read. By the courtesy of the Honorary Secretary (Mr. H. Wimhurst, of Sleaford), we are able to give an illustration of the appliance alluded to by Mr. Drewry.



Mr. Drewry acknowledged that the furnace was not his own, but was, he thought, a patent. The price, he said, was 75 per cent. less than that of any similar appliance at present in the market; while its efficiency was quite equal to the best. Proceeding to describe the furnace, Mr. Drewry said: There are few, if any, things that are more important to gas managers than to see that as little heat as possible passes up the chimney. If the control of the damper is left to the ordinary workman, you will find that it is not regulated at all unless you are always there. The damper of the furnace shown in the drawing requires to be practically closed. If it allows the products of combustion to escape, that is sufficient. This will keep almost all the heat in the setting, to the great benefit of the owner. In my case the furnace burns the contents of the ash-pans taken direct to the fire; a few of the clinkers only being picked out by hand. Three ash-pans give me ample fuel to raise all the steam I require at present. The cost of the furnace complete was about £13; and I expect to pay back the outlay thereon by Christmas next, with a nice little balance besides. It saves the man's time who used to riddle the breeze; and is a clear economy of other fuel. It is very easily worked, and gives little trouble; while the steam goes to form the richest part of the gaseous fuel. The construction of the furnace is so simple that it cannot well be misunderstood; and it can be applied to any kind of boiler or retort-setting. In our case we had the bars, bearers, two doors, and frames (the lower one being faced true), air-blower, and steam-valve, with a rough sketch of how to fix them; and we found a bricklayer and fitted all up in as little time as a furnace renewal would have taken. The price given above covered everything. Before we had the furnace, we used to burn coke mixed with breeze; but, do as we might, very little of the latter found it way to the fire. With the furnace before you, the whole coke cannot well be burnt, as it lies too open on the fire. This prevents the men from using it, if they felt inclined to do so, in your absence.

SIR I. LOWTHIAN BELL ON GASEOUS FUEL.

The Discussion.

In the Journal last week we gave the text of the paper read by Sir I. Lowthian Bell, at the recent meeting of the Iron and Steel Institute in Paris, on the subject of "Gaseous Fuel." The reading of the paper gave rise to a long discussion, the chief points of which, so far as our readers are concerned, are contained in the following abstract report.

Mr. J. Head said there had been a great deal of confusion in the public mind with reference to water gas. It was assumed, because this gas would give a higher initial temperature than producer gas, that therefore it would be better. The real question was what was the loss of heat in the chimney; and, comparing the one gas with the other, the only difference was that the weight of the gases going up the chimney, at the same temperature in both cases, would be less in the case of water gas than producer gas. The difference for furnaces of water gas, as compared with producer gas, when everything was taken into account, was about 0·5 per cent. in favour of the former—that was to say, if they burnt 100 tons of coal with producer gas, they might do with 99½ tons by using water gas; and that was the only advantage. Another question was that of cost. He made a calculation for Mr. Siemens, based on the figures given by the friends of water gas, and he found that, to melt 2 tons of steel and do a certain amount of other work, it would cost 18s. 3d. when using water gas, and only 10s. 6d. with producer gas.

Mr. W. L. Wildy (Engineer to the Leeds Forge Company, Limited), in the course of a long speech, combated the figures and statements in the paper. He said Sir Lowthian Bell had asserted that from 15 to 30 per cent. of the heat of the coal was employed in converting that coal into the gaseous form. From numerous records, he found that the lower percentage was correct for production

gas. In the author's calculations of the comparative calorific effect of producer gas and the fuel from which it was made, he took credit for the whole of the carbon and hydrocarbons in the fuel, while it was well known that there was a large percentage of loss by condensation in the gas-tubes and flue; and that as for the producer gas at the furnace showing a loss of 23·3 per cent., any number of analyses showed losses of from 30 to 40. Some of the figures relating to the foreign works were, while intended to be instructive, quite misleading. The most practical man admitted that gaseous fuel was the most perfect form of fuel known, from its easy applicability, control, and cleanliness. Yet the gases most usually employed showed a loss of at least 30 per cent. of the total heat-units in the fuel, and then gave a gas the flame of which was of far lower calorific intensity than the flame of water gas; the proportion being 1915 : 2839. The detailed statement of the cost of production of water gas at Witkowitz was so extraordinary, and the cost per ton of gasifying the fuel so enormously high, that he could not but think that there must be some error, or that proper supervision had not been kept over the process. That it should cost 12s. 2½d. to gasify a ton of coal seemed enormous; and to steam a ton of fuel would decompose 980 lbs. of water, and produce 35,000 cubic feet of water gas and 140,000 cubic feet of producer gas. Therefore, to provide steam for gas making, 980 lbs. of water were to be evaporated, to which might be added 980 lbs. evaporated for engine purposes; making 1960 lbs., which divided by 9 equalled 218 lbs. of coal (or, roundly, 2 cwt.), at 6s. The cost of fuel thus came to 7¼d. instead of 3s. 6½d. Maintenance charges in the Moravian list were about three times what they would be in England. Having discussed this point, the speaker went on to deal at some length with Sir Lothian's objection to the application of water gas to the Siemens regenerative furnace; giving data respecting a comparison of mixed gases with solid fuel in the production of steel. He cited figures in disproof of the statement that coke at 36s. 5¾d. per ton would produce heat as cheaply as water gas; and contended that this sum should be divided by 2½ at least, bringing it down to 14s. 7·44d. The comparison of the producer gas should, he said, be divided by 3 at least, bringing the value of the carbon in its original condition to 8s. 8d.—equal to coal of the quality taken at 7s. 5½d. per ton. He closed his remarks by pointing out that the quotations from Herr Kupelwieser in favour of producer as compared with water gas were made in forgetfulness of a previous statement made by an official engineer of the Witkowitz works as to the advantages possessed by the latter gas.

Mr. J. E. Dowson remarked that in practice there was no general rule as to solid being more economical than gaseous fuel. In some cases it was better to have one, and in different circumstances the other. Gaseous fuel had the advantage—in the case of gas-engines, which were now being made of considerable power. He could speak with experience of engines, which developed some thing like 1500-horse power; and the general result was that even when a small engine of about 10-horse power was used, the fuel consumption was only 1¼ lbs. per indicated horse power, while in the larger ones it was 1½ lbs. In the installation at Messrs. Spicer's paper-mill at Godalming, they employed gas power with "Otto" engines of about 240-horse power; and Mr. Spicer informed him that, after long working, he estimated that the fuel consumption was only about 1 lb. per indicated horse power. Speaking generally, it might be, and doubtless was the case, that theoretically solid fuel should give better results than gaseous fuel; but his contention was that in practice this was often not possible, and that for many purposes gaseous fuel was better and more economical, especially when the best appliances were used for getting as high a duty as practicable from the fuel.

Mr. B. Loomis (Hartford, Conn.) said he had been largely connected with water-gas projects in America for many years. Producer gas, to be effective, must be made and delivered under pressure, as an efficiency 30 to 35 per cent. better was obtained by pressure. Producer gas, water gas, and coal gas should be made out of the cheap soft slack coals of the country. Actual demonstration and figures showed that they were able to make 40,000 cubic feet of water gas, mixed with coal gas, from a ton of bituminous coal. This mixture had about 350 heat-units per cubic foot, which was a very high calorific value. In the case of gas made from anthracite coal, it was 290 units; but from bituminous coal with more hydrogen in it, as well as some marsh gas, the heating power was increased to the extent he had mentioned. Producer gas made from soft slack coal in properly built furnaces was far superior to the producer gas or coke with a blast furnace; and it could be made entirely free from tar, as this might be converted into gas. Water gas was being used for metallurgical purposes. At large works in Massachusetts, the entire forging was done at a saving of 30 per cent. of labour and nearly 50 per cent. of coal. Another works, near Boston, was entirely run with water gas. In Cincinnati, gases were mixed together and used; and the cost of coal had been reduced more than half, and the time for drying the coal from 12 to 2 hours, besides the amount of labour that was saved.

Mr. Samson Fox said he had many times found himself on the same side as Sir Lowthian Bell; but in the present matter he was ranged on an opposite platform. In supporting his contention, he did not rely on anything but absolute fact, the result of two years' experience in actual working. It was stated in the paper that water gas would not give as good results as solid fuel He could not deal with gaseous fuel generally; but he felt competent to speak as to water gas. The author was wrong first of all in the cost of producing. In one place the paper said that 12s. 2½d. was the cost of gasifying a ton of fuel; and on the same page it was stated that the figures which the Leeds Forge gave were 2s. 8d. It was evident that one side or the other must be altogether wrong; and he would only remark that the 2s. 8d. was the result not only of their own calculations, but was deduced from figures taken out by entirely independent authorities. The cost of the fuel was also wrong; for in one place it was put down at 13s. 5d., and in another place at 10s. The paper said that coke was used by the Leeds Forge Company; and exception was taken to this because, if water gas superseded ordinary gas, there would be no gas-works to go to for the coke. In reply to this objection, he would only say that they used coke because it was the most convenient form of fuel to be obtained; but it was to be remembered that this was a fuel out of which some one else had taken a large quantity of gas. In some works, however, there was a great quantity of breeze, which could be used just as well as any other material for making water gas. Sir Lowthian was wrong in his estimate of the cost of steam, which he put down at 3s. 6½d. per ton of coal treated; this being according to the figures sent him from Germany. This item was included in the 12s. 2½d. charged to gasification. He (Mr. Fox) considered the estimate much too high, as he thought 6d. per ton of fuel would be sufficient to cover the item of steam required. Taking these three features—the cost of fuel, of gasification, and of steam—to be wrong, it would be found that the estimate of the author must be entirely recast in order to give a true idea of the commercial aspect of the question. As to the pressure at which the gas might be used, an instance was given in the paper, in which it was stated that as much water gas was to be sent through a 1½-inch pipe as would be equivalent to ordinary gas passing through a 36-inch pipe. It should be explained that the gas was to be conveyed under considerable pressure. It had been arranged to supply a small town with water gas for lighting purposes. Round this town were seven villages, lying at distances ranging between three and seven miles. The villages had arranged to take the gas if it could be conveyed to them. There was no difficulty in this, if the gas could be reduced in volume to an equivalent to 600 lbs. pressure, so that small pipes and small gasholders could be employed. He hoped to do this in many cases; for there could be no doubt that, for general lighting, water gas was better and cheaper than ordinary gas, and certainly very much cheaper than the electric light. At the Leeds Forge it had been used for 18 months; and he had had it in his own house for eight months. He found it in every way an advantage—first on the score of purity, but more especially in cost. The charge for ordinary gas with him was 3s. 9d. per 1000 cubic feet, but he could supply the water gas at 1s. 1d. Besides the many new openings there might be for utilizing water gas for manufacturing purposes in the future, within the next two or three months there would be a dozen plants at work which were now building. There were positions in which the new gas would be of the greatest value—such, for instance, as where ordinary gas would not be sufficiently clean. He concluded by inviting the author of the paper to visit the Leeds works, so that he might examine the whole process, and see for himself the carrying out of working details upon which his (the speaker's) estimates were based.

Mr. G. Riley asked Mr. Fox how he proposed getting over the difficulty of employing so poisonous a gas as carbonic oxide for the lighting of private houses—a gas, too, without smell.

Mr. Fox said in the first place it might not be generally known that the larger part of the gas-piping in houses was in a leaky state at the present time, and that something like 25 per cent. of the amount of the gas bill was owing to the leakages existing throughout the country. Let them make thoroughly tight gas-fittings, and introduce into the gas a little volatile liquid that would give warning of a leakage the instant it occurred, and there would be no fear of injury resulting from an escape of gas. The percentage of carbonic oxide in water gas was perhaps 0·45. He had left his family for the past eight months, and he would not have done so if he had not made quite sure that the fittings were tight and safe.

Herr Kupelwieser said he wished to explain that at the time he wrote his first letter he gave about 13s. a ton for coke; whilst at another time, and taking an average, the price was 10s. 3d. a ton. At that price 1000 cubic metres, or 35,316 cubic feet, of producer gas would cost 3s. 1d., as against 1000 cubic metres of water gas at 11s. 6d., or 1000 cubic feet at 4½d. This might be compared with 1000 cubic metres of coal gas at £3, or 1s. 8½d. per 1000 cubic feet. These prices were much the same as those given by Sir L. Bell, though arrived at differently. He wished to point out that the 1000 cubic feet of steam, costing 3s. 6d., referred to German practice and not to Witkowitz. The apparatus he used was similar to that adopted by Mr. Fox; and it had been working two years with satisfactory results.

Sir F. Abel thought the Institute was much indebted to Sir Lowthian Bell and also to Mr. Samson Fox for the valuable information they had afforded on the subject of gaseous fuel. Water gas itself was not used, pure and simple, for metallurgical purposes, but mixed with other gases. With regard to the danger from poisonous effects, he doubted if it would be wise to place their lives in the hands of the average gas-fitter, and admit a poisonous gas into their homes on the faith of his work being perfection.

M. Pourcel having made some few remarks as representing France,

Mr. F. Siemens said he had been much struck with Mr. Samson Fox's statement that he did not use water gas pure for furnace

purposes, but mixed it with the other gas made in the same apparatus. This practice would agree with his own experience in using gases; and as the resulting gas would be very similar to that made in the Siemens gas producer, he could not see any advantage in the proposal to make two gases separately to be afterwards mixed. He had had a great deal of experience for a long period with various kinds of gases, using them for furnaces with which he had been experimenting; and the result of his experiments was to divide gases into two classes—luminous and non-luminous. He found non-luminous gases to be of very little use for furnace purposes, as they were only suitable when heating with contact. For incandescent gas lighting, for instance, the non-luminous gases could be used, as the flame struck upon the material which had to give the light. Non-luminous gases (to which class water gas belonged) did not radiate light or heat sufficiently; and they could not therefore possibly heat large furnaces with them. They would be obliged to mix water with gas made from coal, or carburet it in some other way, in order to use it in large furnaces. This would be a rather complicated operation. According to his (Mr. Siemens's) experience, the presence of hydrocarbons in gas for furnace purposes was of the utmost importance. He read a paper a few years ago before the Institute, in which he stated htat large furnaces could not be worked with non-luminous gases. If, however, water gas was mixed with illuminating gas, as had been proposed by Mr. Fox, then, of course, it would do very well.

Sir L. Bell then replied. He said he was at a loss to understand why Mr. Wildy and Mr. Fox should complain of the high price he had put on the fuel, because it was their object to show that the water gas was cheaper than the solid fuel; and if the high price of fuel made the gas appear dear, it made the solid fuel dear also. The question was one of comparison. It was beside the question, also, whether coke or coal were used, from a scientific standpoint; the problem being whether, from a calorific point of view, a given amount of fuel could be used more advantageously in a solid state direct or by being previously gasified. He had seen water gas in use at Frankfort years before, and had come to the conclusion then—and this opinion he still held—that in some situations it would be good; but this was a very different thing from saying, as really seemed to be claimed for it, that it would be suitable for all purposes. Exception had been taken to the construction he had put on the statement in the pamphlet as to the sizes of the pipes required to supply water gas and the ordinary coal gas. Mr. Fox had offered an explanation; but he (Sir L. Bell) would like to ask what power it was proposed to apply to force gas at 600 lbs. pressure through a small pipe for 10 miles. For his own part, he thought the friction would be so great that he should not be surprised if the pipe became red hot. Stress was laid on the fact that cheap water gas could be made from breeze, which was a bye-product of gas-works; but Mr. Fox proposed superseding existing gas-works by his system. Where, then, would the breeze come from? As to the cost of converting solid into gaseous fuel, he himself had had some misgivings as to 12s. 2½d. being quite right until Mr. Kupelwieser spoke. Even the 2s. 8d. of Mr. Fox was, however, a heavy percentage on the price of coal or coke. In conclusion, he said he only desired to get at the truth of the matter. He should therefore gladly avail himself of Mr. Fox's offer to allow him to make a complete investigation at the Leeds works; and it would be found that, if he had been overbold in putting forward the statements in his paper, he would equally show his courage in acknowledging any errors he might have made.

A vote of thanks was then unanimously accorded to Sir L. Bell for his paper.

The Danger of Water-Filters.—In a series of experiments with water-filters reported to the Rhode Island Medical Society, Dr. G. T. Swarts has prepared certain facts which are opposed, says the *Family Doctor*, to the general belief regarding the value and efficiency of filters as commonly used in the household for the purification of drinking water, and which, from their important bearing on health, are believed to be worthy of more general recognition. The results obtained prove that some filters when first used successfully remove a certain proportion of organisms from the water. Other tests made 17 days later showed in every case a marked increase in the number of colonies in the filtered, as compared with unfiltered water. For instance, the unfiltered water contained 36 colonies of growth, while the filtered water showed the presence of colonies to the number of 2000, 9000, and 10,000. An examination on the 70th day showed an increase, in the case of one filter, of 117,000 colonies. Another series of experiments was made to determine how far the consumer could cleanse his filter or sterilize it in some simple manner. The results showed, however, that, even with every possible caution, the number of organisms in filtered water exceeded by several thousand the number in unfiltered. These investigations show conclusively that the organic matter in the meshes or interstices of the filtering media contained organisms which increase at a very rapid rate while the filter is or is not in use, and especially if its position is in a warm kitchen or in close proximity to a hot-water pipe. The lesson to be drawn from these experiments is obvious. Filters which are not easily cleansable, and in which the filtering medium is not readily renewable, do, by becoming clogged and from the difficulty of perfectly cleansing them, foster the very dangers to health which they are designed to prevent.

Register of Patents.

Preparation of Tar for Use in the Manufacture of Artificial Fuel.—Lake, H. H.; communicated from F. Honnay, of Fleurus, Belgium. No. 15,393; Oct. 25, 1888. [6d.]

This invention refers to the mixing during fusion of tar from coal-tar distilleries—that is to say, tar obtained from gas-works or coke-furnaces—with tar produced by blast-furnaces; the same being effected at any suitable temperature and in any suitable proportion.

Gas Heating-Stoves.—Leeds, L. W., of Old Jewry, London. No. 15,410; Oct. 26, 1888. [6d.]

In specifications Nos. 5841 and 11,930 of 1886, No. 668 of 1887, and No. 6569 of 1888, are described certain constructions of gas and liquid-fuel stoves; one of the essential features in all the constructions being that the flame should be beneath an asbestos or other refractory arch or layer. The present invention relates to stoves of this class, and consists in constructing a heat chamber at the back, and if desired also at the foot of the stove.

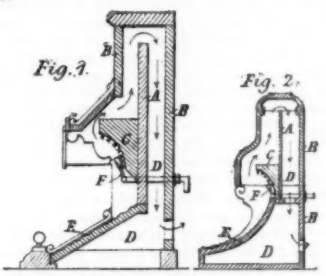
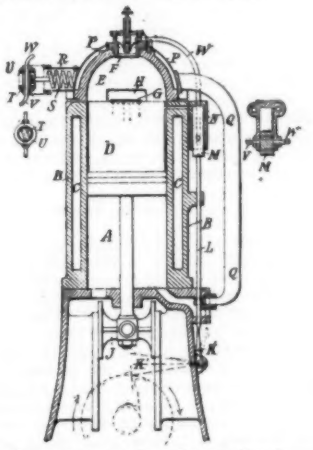


Fig. 1 is a side sectional elevation of a stove with a terra-cotta or fire-clay partition or bridge-wall. Fig. 2 is a side sectional elevation of a terra-cotta or fire-clay stove with a metal partition or bridge-wall.

The partition or bridge-wall A is placed in the stove body B; and it extends to a level above that of the refractory arch C, which may be attached or hung therefrom. With this construction the products of combustion and a portion of the heat will travel past the refractory arch, up and over the bridge-wall or partition A to the heat-chamber D at the back of the stove. This chamber may be provided with an outlet at the bottom if desired; and the front reflecting plate E beneath the burners F may be so raised and supported as to practically form one of the walls of the heat chamber. The main body of the stoves may be made of metal, terra-cotta, fire-clay, or other substance, and ornamented according to taste; while an ornamental hood G may be provided with a coloured glass front H.

Gas Motors.—Boult, A. J.; communicated from E. Capitaine, of Berlin. No. 15,845; Nov. 2, 1888. [8d.]

This invention relates to gas motors in which the combustion chamber is not cooled from the outside by being surrounded by water, and in which the combustible charge is compressed before its ignition; and the object aimed at is to keep the walls of the combustion chamber at a certain degree of temperature, because if they become too hot, spontaneous, or so-called pneumatic ignition of the combustible mixture will take place during the compression—*i.e.*, too soon.



The illustration shows a gas-engine whose action in general is like the "Otto" engine. A is the cylinder surrounded by a casing B. In the intervening space, the cooling water is contained. D is the piston; E, the combustion chamber; F, the valve for the admission of the gaseous mixture; and G, the valve for the escape of the products of combustion, arranged in the port H. J is the cross-head, which, in the usual manner, is connected to the crank-shaft. The eccentric is connected by a rod to an elastic arm K^1 of a bell-crank lever K K^1. The arm K serves as a support for the rod L and piston M, which latter fits closely in a cylinder N, communicating with the interior of the combustion chamber or cylinder by the passage O in such manner that the pressure of gases in the combustion chamber is transmitted to the cylinder, and tends to force the piston M downwards, while a spring tends to move it upwards. The combustion chamber is surrounded by an outer jacket P, leaving a chamber between the two. This chamber is provided with tubes Q and R—respectively for the inlet and outlet of air. The inlet-tube is in connection with the end of the cylinder opposite the combustion

chamber; and in the outlet-tube is arranged a spiral S, consisting of two flat metal ribbons laid one over the other—one being of steel or iron, and the other of copper or silver. This metal spiral is similar to those employed in the metal thermometers, and is fastened at one end to the outlet-tube R and at the other to the spindle of a valve T, which can turn freely in the casing U. In this valve is formed a passage, which serves to allow the water to flow from the pipe V to the pipe W. The piston M is also formed with a passage, which similarly serves to connect the pipes V and W.

The arrangement works as follows:—The piston at its underside first of all draws air into the lower part of the cylinder, and then if the slide-valve, which is secured to the rod L, is removed from the port during the down stroke of the piston D, the air will be driven out from the cylinder into the space between the casing P and the combustion chamber E. By contact with the combustion chamber, the air becomes more or less heated; and the metal spiral S turns the spindle in a well-known manner, in consequence of the varying rates of expansion of the different metal strips. The valve T is so adjusted in relation to the spiral S that, by a temperature of the combustion chamber of about 300° C., the passage will connect the water conducting-pipes V and W; and the water will then flow to the combustion chamber and cool it. As the temperature lowers the temperature of the air passing through the tube R and around it, the metal spiral S will close the valve T, and thus cut off the water supply. The spring used is of such strength that it cannot overcome, but will slightly yield to, the highest pressure which may act on the piston M. This highest pressure is attained when the piston D is in its highest position (as represented); and at the same moment the explosive mixture is ignited by any of the well-known means applied to gas motors. In this position of the piston, the arm K (actuated by an eccentric) is below the rod L, and thus prevents the descent of the piston M. If the combustion chamber becomes too hot, spontaneous combustion of the explosive mixture will take place during its compression—*i.e.*, before the piston D has reached its highest position; and in consequence a decrease of power will result. In such case the lever-arm K has not yet arrived beneath the rod L; and the untimely pressure consequent on the premature ignition of the explosive mixture, forces the piston M down, and in this manner connects the pipes V and W. The water then flows through the pipe W to the inlet-valve F, and will be drawn into the combustion chamber and the cylinder together with the explosive mixture; or else into the space surrounding the combustion chamber. The air forced by the descent of the piston D through the opening X and pipe Q to the outer surface of the combustion chamber serves to cool the latter. The lever K K^1 may he dispensed with if the spring is of sufficient strength to resist the highest normal pressure; for if the combustion chamber becomes too hot, the maximum pressure of the explosive mixture will increase considerably, and the strength of the spring, being thereby overcome, will be lowered.

Friction-Clutch or Coupling for Gas-Engines.—Boult, A. J.; communicated from E. Capitaine, of Berlin. No. 15,846; Nov. 2, 1888. [6d.]

The object of this invention is to permit an automatic uncoupling of the belt or driving-pulley of a gas-engine in case there should be undue strain upon it, for the purpose of avoiding any decrease in the speed of the motor, as such decrease lessens the power of each stroke of the motor in consequence of the gases losing some of their expansive power through being too long in contact with the cooled walls of the cylinder. The present arrangement also allows motors to be started without having to shift the belt on to a loose pulley.

To the spokes of the fly-wheel is fastened a projecting ring surrounded at a certain distance by another ring cast in one piece with the belt or driving-pulley. The fly-wheel is keyed on to the driving-shaft, while the belt pulley turns loose on it. Between these two rings are placed segments provided with ribs or projections fitting into recesses formed in the periphery of the ring on the fly-wheel; and they are thus obliged to revolve with the fly-wheel. There is very little space between the segments and the rings; so that when the fly-wheel turns, the segments are forced by centrifugal power against the ring of the belt pulley, and act as a friction-clutch and turn the belt pulley. The weight of the segments is adjusted in such a manner that, in case of any extra strain on the belt pulley, the segments will slip in the ring of the belt pulley, and the motor will lose little of its speed, and will not stop even by an excessive resistance or accident to the machinery driven by the belt.

Gas-Engines.—Lalbin, E. L., of Nantes, France. No. 16,268; Nov. 9, 1888. [8d.]

In carrying out this invention, the patentee proposes to employ three similar cylinders arranged radially in the same plane; having a successive action in pairs, and operating one another. In this way, the power produced by the explosion of any gaseous mixture beneath the piston never itself serves to compress under that piston the mixture which is to produce the following explosion in the same cylinder. The action on the crank is said to be almost constant; and a very light fly-wheel is employed, while in some cases the fly-wheel can be altogether dispensed with. Each cylinder consists of an air-pump driven from the motor cylinder, or that in which the explosion takes place at the required moment; and this pump is provided with suction and delivery valves connected together in a valve-box. They are operated automatically, and the ignition effected by a drum having cams which, by means of suitable mechanism, turns in a contrary direction to the crank and at half the speed.

The ignition of the mixture is effected by utilizing the property that platinum and other metals of a like nature possess, of condensing gases and causing them to combine with oxygen. This process consists, firstly, in causing a current of air and hydrogen, more or less carburetted, to impign upon platinum heated to a sufficient degree, which air and hydrogen combining bring the platinum to a state of incandescence; and, secondly, in bringing the incandescent platinum in contact with the gaseous mixture that it is required to ignite, in order to produce detonation or dilatation.

Gasholders.—Gadd, W., and Mason, W. F., of Manchester. No. 18,119; Dec. 12, 1888. [8d.]

These improvements, relating so the construction of gasholders, have for their object the supporting of the same in their working position, in such a manner as to enable the external or upper guide-framing hitherto employed for the purpose to be dispensed with, and yet to give the requisite stability. Further reference in this place to the patentees' proposals is unnecessary, seeing that the full text of the specification, with the illustrations accompanying it, appeared in the Journal as lately as the 24th ult., p. 599.

Gas Engines and Carburetters.—Allison, H. J.; communicated from L. F. M'Nett, of Yonkers, U.S.A. No. 12,045; July 30, 1889. [6d.]

This invention (designed especially for application to gas-engines used to propel cars or vessels, and supplied with gas manufactured on the car itself) relates to apparatus in which water is circulated in such manner as to keep the cylinder of the engine cool, and to heat a gas generator for carburetting air with naphtha or other volatile hydrocarbons so as to make gas.

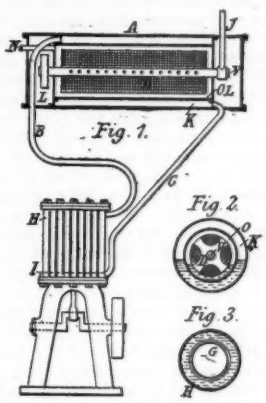


Fig. 1 shows apparatus embodying the invention; the engine being shown in side elevation, and the carburetter and appliances used therewith in longitudinal section. Figs. 2 and 3 are cross sections of fig. 1.

A generator D (of the kind hereafter described) is surrounded by a jacket K, formed of outer and inner walls A R, with ends. The outer wall or shell A is provided with double heads, forming spaces L, which serve as a protection for the various appliances used in the construction. The reservoir or jacket receives the heated water through the pipe B, as it comes from the jacket or chamber H, surrounding the cylinder G of the engine. The generator consists of a cylinder mounted on a hollow perforated shaft V, which is provided with a pulley, so that it may be rotated. The cylinder rotates in a chamber O, containing volatile hydrocarbon; and it is provided with a series of floats made of woven wire or cloth filled with some absorbent material, and attached to the inside of the cylinder. The cylinder is of open work—as, for instance, of woven wire or of a sheet of perforated iron. The float takes up the naphtha in the chamber O, and allows it to fall in fine streams, or as drops, in the space in the upper part of the cylinder. J is an inlet, which permits the air to be forced into the carburetter through the hollow shaft; and N is an outlet, through which the carburetted air is carried away for use. The pipe B is the exhaust for the heated water to pass out of the chamber H. It connects with the reservoir K, as shown in fig. 1. By this means the hot water is allowed to drip over the shell of the generator, and heats the naphtha more readily. Then as it becomes cold, settles, and passes out by the exhaust-pipe C, into the chamber H, at L. Thus a circulation is kept up between the engine E and the reservoir or jacket K; the explosion of the gas in the cylinder G heating in the chamber or jacket H, and causing it to pass through the pipe P to the jacket, where it becomes cold by heating the naphtha and forming gas, when it is again returned to the jacket H.

APPLICATIONS FOR LETTERS PATENT.

15,409.—Somerville, J., and Cutler, S., "Improvements in apparatus for charging and drawing gas-retorts." Oct. 1.

15,421.—Beaumont, H. G. F. de, "Improvements in the manufacture of water gas." Oct. 1.

15,426.—Morse, M. A., "Improvements relating to the manufacture of gas and to apparatus therefor." Oct. 1.

15,500.—Lambert, P. G., "A device for increasing the illuminating power of gas." Oct. 3.

15,532.—Phillips, J. J., "Protective subway for laying in supply-pipes for water, gas, or other purposes." Oct. 3.

15,599.—Thompson, C., "Improvements in gas-furnaces." Oct. 4.

Additional Powers for the Aldershot Gas and Water Company.—A special meeting of the Aldershot Gas and Water Company was held last Wednesday, to authorize the Directors to apply to the Board of Trade for a Provisional Order for the following powers:—(1) To increase the capital of the Company by the issue of £20,000 of ordinary or preference shares, with the usual borrowing powers. (2) To adopt the auction or tender clauses for the sale of shares. (3) To adopt the sliding scale; the initial price of gas to be 3s. 6d. per 1000 cubic feet. (4) To supply gas at an increased illuminating power beyond that provided by the Aldershot Gas and Water Act, 1866, and to make provision as to the testing and pressure of gas. (5) To supply gas and water, or either, in bulk within or without their district. (6) To purchase and hold more land, not exceeding 20 acres, for the purpose of the gas and water works. (7) To construct, maintain, and work a tramway from the Tongham Station of the London and South-Western Railway Company to the gas-works of the Company, and to acquire land for the purpose. The Aldershot Local Board of Health, who had decided to oppose the application, had consented to withdraw their hostility on certain terms being accepted by the Directors; and the latter recommended the shareholders to agree thereto. This they did; and therefore no obstacle may now be expected to the granting of the powers sought by the Company.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

GADD AND MASON'S GASHOLDER PATENTS.

SIR,—I have naturally read with considerable interest the remarks of Mr. Bridge, made at Doncaster, on my inventions relating to the guiding of gasholders. Although agreeing very much with what he said thereon, I nevertheless think he may not have realized the chief reason for our patenting the "elaborate" methods, more or less, he so happily alluded to.

The spiral guide-framing, which obtained such commendation from himself and others, and which will soon be practically demonstrated at Northwich, is the principal outcome of my studies on the subject, and the invention which I regard as most simply and perfectly solving the problem of guiding gasholders without upper framing. But, as Mr. Bridge well enough knows, when a new invention of value is brought out, there are immediately evolved numbers of imitations, or attempts at evasion of the first inventor's plans—as originality is not a very widely-diffused gift. It was to prevent the field being flooded with these imitations or variations of the originally published idea, that my colleague and self reluctantly determined to patent the only other (as we think) practical method of guiding, invented many months previously —viz., by means of gearing of some kind, torsional or tensional, or a combination of both.

Now, we do not think, any more than does Mr. Bridge, that any of these variations are either so good as the spiral guiding, or likely to be accepted with favour by gas engineers; except perhaps for small holders or maybe for added lifts to existing holders.

With regard to the long-heralded, and now published, plan of Mr. Pease, I may probably be pardoned for saying that I fail to see in it anything more than another variation, in detail—and that a slight one—of our specification No. 18,119, dated Dec. 12, 1888, which is two days *earlier*, I believe, than Mr. Pease's application. It is stated in our specification, which you have already published, that "it will be obvious that other varieties of arrangements of gearing may be employed—both torsional and *tensional*, and combinations thereof, which like those shown are mechanical equivalents of each other," &c. It, therefore, is sufficient to test this plan by the second claim of our specification, which reads thus: "2. The employment of *tensional* gearing arranged round a gasholder, or gasholder tank, which gearing connects or gears together *points upon and at intervals around such holder*, so that one point moving upwards or downwards communicates, through such gearing, the tendency of motion to the other points round the holder, for the purpose and in manner substantially as herein shown and described.

It will be easy for your readers, with the help of the words I have italicized, to form their own opinion as to whether or not Mr. Pease's plan may be described by the foregoing words of claim.

Manchester, Oct. 11, 1889. W. GADD, C.E., F.R.M.S.

PROPOSED ACQUISITION OF THE BURLEY-IN-WHARFEDALE GAS COMPANY'S PLANT BY THE LOCAL BOARD.—At the meeting of the Burley-in-Wharfedale Local Board on Monday last week, a letter was read from the Local Government Board with reference to the proposed purchase of the property of the Burley Gas Company, Limited, inquiring if the Company had parliamentary powers of gas supply, and, if so, what were the limits under such powers. The Board also desired to be informed whether the district of the Board or any part of it was within the limits of supply of that or any other Company possessing parliamentary powers, and whether the Board proposed to purchase or were possessed of gas-works, or in what way the gas would be obtained. The Clerk reported that he had replied to the Local Government Board's letter, stating that the Local Board had agreed to pay the sum of £1350 for the plant belonging to the Company, which consisted of mains, branches, valves, and meters. The Company had no parliamentary powers to supply gas within the district, neither had any other company. The Company procured their supply from a private firm (Messrs. W. Fison and Co.); but the Board intended to erect works of their own, and had been in treaty with several parties for a site. They had, however, met with much opposition, owing to the fact that they must have the written consent of any person residing within 300 yards of such proposed works; and Messrs. Fison and Co. had therefore expressed their willingness to continue to supply the Board for a time. The Board intended to accept the offer, as it would probably enable them to meet with a suitable site on which to erect the works. The question of applying for a Provisional Order was discussed; but the matter was deferred until the Board heard further from the Local Government Board.

RIPON CORPORATION GAS AND WATER SUPPLY.—At the meeting of the Ripon City Council yesterday week, it was stated that Mr. J. Laycock, the Engineer of the Keighley Gas-Works, had been appointed to report on the Corporation gas-works, and that the balance in hand on the working expenses for the past year was £609. Alderman Baynes, the Chairman of the Water Supply Committee, made a statement respecting the completion of the scheme of water supply by gravitation from Lumley Moor. The total cost of the works had been £25,000; and the expenditure above this amount in completing the works passed by the Council and recommended by the Engineer was estimated at £753. For this debt they had a substantial asset in the old pumping station, which, with the land adjoining, was a few years ago valued at £1700. Power was given to dispose of these works under the Ripon Corporation Act of 1886. It was proposed to establish a service reservoir near Studley Royal. For the half year ending Sept. 29 last, the working expenses amounted to £1168, which he would take for the whole year at £2406, as previously calculated. The income for the same period was £974, which for the year he would take at £1948. The North-Eastern Railway Company at Ripon station had that day commenced to use the Corporation water; and the estimated income from that source was £272 per annum—raising the total income to £2227, and making the estimated deficit £179. For the last ten years the average annual deficit paid out of the district rate for the pumping works was £544; so that the new works compared favourably, with the old ones, and there was a prospect that, with increased consumption, the deficit would gradually diminish. The Town Clerk mentioned that there was an accumulated debt on the old water-works amounting to £1200 or £1500; and this had to be paid off in two years. In 1888, £1278 was taken out of the district rate for water purposes, and in 1889 £980.

Legal Intelligence.

WESTMINSTER POLICE COURT.—TUESDAY, OCT. 8.

(*Before Mr.* SHEIL.)

THE INCONVENIENCES OF COMBINED WATER SUPPLIES.

Complaint was made to-day by two water consumers, carrying on business in the Brompton Road, of the action of the Chelsea Water Company in cutting off their supply without any previous notification, although they held receipts for the rate due at Midsummer. It appeared that a neighbouring tradesman was in difficulties, and his water-rate was in arrear. The service of water to his house was in connection with the services to applicants' premises; and consequently all three suffered for the default of one.

Mr. SHEIL: What do the Water Company say to your complaint?

One of the complainants said that they could obtain no redress, and were told that they ought to have separate supplies. He did not see why he should be called upon to go to the expense of making an alteration in the pipes, for during 13 years, for which period he had been tenant of the house, and no doubt for years before, the same system had prevailed.

Mr. SHEIL: The Company have a right to cut off the water supply to the defaulter; and if in doing so they necessarily cut off yours, I do not see how I can interfere with them.

Complainant: Well, it is a very serious thing; and a high-handed proceeding. We have had no water since last Wednesday, and yet we owe nothing. More particularly we complain of the fact that we never had the least intimation of the intention of the Company to cut off the supply; and we are informed that before it will be put on again all the expenses and arrears must be paid.

Mr. SHEIL told the applicants he could not grant a summons on the facts disclosed, and advised them to go to the Company again.

Complainant said this was useless, as they treated everybody with the same inconsiderateness.

SATURDAY, OCT. 12.

To-day, Mr. *Schomberg*, whip maker, of Brompton Road, one of the complainants mentioned in the foregoing report, renewed his application for process against the Company, pointing out that, in his particular case, the provisions of the Water Companies' (Regulation of Powers) Act, 1887, applied.

Mr. SHEIL said it was disclosed on the previous occasion that three houses derived their supply from one main communication. This was rather a curious state of affairs.

Applicant said no doubt it had existed for years; but it would be much better, of course, if each house had a direct and separate supply. The fact was, at one time all the rates were paid by one man in one interest; but for a considerable time past there had been separate ratings, and in his case the landlord paid the rate, and it was included in his rent. He and his next-door neighbour (the other complainant) had nothing to do with the man who had not paid the Company; yet the Company required the arrears and expenses to be paid by applicants before the supply was renewed.

Mr. SHEIL asked the applicant if he had been to the Company's office since he was last at the Court.

Applicant replied in the negative.

Mr. SHEIL said that if the facts were as applicant had stated them, he seemed to have a good case, and the Company ought to help him. Let him go to them again, point out the provisions of the Act of 1887, of which no doubt they were well aware, and, if redress was refused, he could apply to the Court again, bringing with him the agreement between himself and his landlord.

Applicant said he would do this; but in the meanwhile he was without water.

Later in the afternoon, the District Collector of the Company said he attended the Court at the request of the Secretary, to state that he was quite willing to listen to any proposition Mr. Schomberg and his neighbour had to make with a view to an amicable settlement of the dispute. At the house where the water had been cut off, no rate had been paid for a long period; and the Company were unaware, at the time the supply was stopped, that the applicants' houses were supplied from the same service-pipe.

Mr. SHEIL said he understood that separate demand notes were left in respect of each house; and, if this were so, it was, to say the least, a clumsy and extraordinary thing that their supplies were not independent.

The COLLECTOR: I believe there is an Act of Parliament compelling landlords to have a separate supply for each house; but it is not at all an uncommon occurrence in old properties to find there is but one connection for several houses. No doubt it is a hardship on these two people, who have paid their rates; but the Company cannot help it.

Mr. SHEIL: As long as this state of things lasts—several houses being supplied through one pipe—there will be trouble and litigation. Now you have had your say the matter must end; and if there is any further application for process it will be determined on its merits. It will be better, if possible, to come to some amicable arrangement.

CARDIFF POLICE COURT.—MONDAY, OCT. 7.

(*Before Mr.* DAVID JONES, *Mayor; and a Bench of Magistrates.*)

CONVICTION FOR CUTTING OFF A SHOPKEEPER'S GAS SUPPLY.

This was a summons issued at the instance of Mr. Alfred Tuck, against the Cardiff Gas Company for refusing to supply gas to him at premises in his occupation in St. John's Square, Cardiff.

Mr. J. H. JONES appeared for the plaintiff; Mr. EVANS for the defendants.

Mr. JONES having briefly addressed the Court,

Mr. *Tuck* was called; and from his evidence it appeared that he owed a sum of £2 7s. 8d. for gas supplied to him at premises in Bute Road; but he owed nothing in respect of those in St. John's Square. The Company, he said, cut off the gas supply from both places; and he had been put to much inconvenience by the discontinuance of the supply to the St. John's Square house.

Cross-examined, witness admitted that he had owed various sums to the Company which had to be paid by his guarantors, though such guarantors were fully indemnified by plaintiff in respect thereto.

Mr. EVANS here objected that the summons bore a wrong date, and should not have been issued against the Secretary, Mr. G. Clarry, but against the Company. He should insist on pressing these objections, because the Company's Secretary had been brought there a second time unnecessarily.

Mr. PRICE asked if Mr. Evans thought it really proper to press a mere technical objection. At most it would mean another adjournment, to the inconvenience of both parties.

The MAYOR remarked that it was a very undignified defence and looked like persecution.

Mr. EVANS said he did not consider people had any right to issue summonses haphazard. They should consider before they did so who were the parties against whom they were entitled to recover. Why should they issue a summons against the first person who came into their heads?

Mr. JONES: It is nonsense to speak of haphazard summonses. The official representative of the Company has been summoned.

Mr. EVANS said the Secretary had been summoned for committing an offence which he could not commit, and which the Company alone were enabled to commit.

Mr. JONES observed that the Company were distinctly bound by the Act to give 24 hours' notice of their intention to cut off the supply. This they did not do.

Mr. EVANS contended that making the application for the money, and being refused, was reasonable notice that the Company had a right to treat the matter as a personal debt. If plaintiff owed money in connection with one house, the Company were entitled to cut off the supply in respect of any other belonging to the same person.

The CLERK (Mr. Rees) dissented from this view.

The Bench imposed a fine of 20s. and costs, and granted a case for the High Court.

CONISBORO' PUBLIC LIGHTING.—The inhabitants of Conisboro' are at present considering the question of lighting the streets of the village. A proposal is afloat for employing gas for the purpose; but the high price —5s. per 1000 cubic feet—rather operates against its adoption. A section of the residents advocate making arrangements with an electric lighting company.

VAGARIES OF ELECTRIC LIGHTING AT CHATHAM.—The electric light has lately been adopted by certain tradesmen in Rochester and Chatham; and, from the accounts of the performance of this illuminant which have reached us from our local correspondent, we should think they have cause to regret their abandonment of gas. Within the past few days, no less than three collapses are reported, all being at busy times in the evening.

FURTHER CAPITAL POWERS FOR THE CAMBORNE WATER COMPANY.—A special meeting of the Camborne Water Company was held last Thursday week, to consider the following resolution:—"That the Directors be, and are hereby authorized and instructed to cause proper application to be made to the Board of Trade for a Provisional Order, authorizing the raising of additional capital by the Company by the issue of 300 shares of £10 each nominal." From a statement made by the Chairman (Mr. W. C. Pendarves), it appeared that the capital of the Company at present was £12,000, divided into 1200 shares of £10 each. They had borrowing powers to the extent of £3000; and this amount had been raised on debentures, for five years, at 3½ per cent. They had also made themselves responsible for £400 on a promissory note at 4 per cent., as a temporary expedient for the welfare of the concern. It was estimated that there would be required a further sum of £500 for the completion of a new reservoir; and therefore it was necessary to take steps to obtain additional capital powers. The resolution was agreed to.

THE QUALITY OF THE GAS AT BRISTOL.—In the course of the proceedings at the meeting of the Bristol Town Council, sitting as the Urban Sanitary Authority, last Tuesday, Alderman Levy, referring to the payment of the account of the Gas Company for gas supplied to the public lamps, asserted that there was a universal complaint throughout the city of the bad quality of the gas. Mr. Wills supported this statement. Alluding to the crisis between the Gas Company and their *employés*, he said that, though he would be sorry to see a strike, it might not be an unmixed evil, because many thousands of householders would be driven to use lamps if the city were thrown into darkness; and many of them would not return to it until an improvement took place in its quality. The Gas Examiner (Mr. B. Kitt) reported that the Company supplied the standard quantity of light. Mr. Williams thought the Corporation should approach the Company, and ask them to raise the standard. Mr. Inskip considered that, if there was a complaint to make about the gas, it should be formulated in a proper manner; and they ought not to mix up a dispute between workmen about wages and the quality of the article supplied to them. A great many of the complaints in regard to the gas arose from the use of defective burners. Mr. Barnett said it was elicited at the last meeting of the Council that there was an excess of ammonia in the gas; and until this was remedied, the quality would remain bad. Alderman Nash observed that the Gas Examiner had informed them in his reports that in Bristol the standard for illuminating power was the lowest in the kingdom—viz., 13½ candles; and until they could get an amendment in the Act of Parliament —which they would endeavour to do whenever the Company went for a Bill—they had no power to insist on gas of higher illuminating power being supplied. He believed, however, that the Gas Company were willing to give a better standard; and, in fact, they actually did supply gas of about 15-candle power. They had a very able and conscientious Examiner in Mr. Kitt. The matter then dropped.

THE INCREASE IN THE PRICE OF GAS AT BARNSLEY.—The members of the Barnsley Town Council had before them last Tuesday the resolutions passed at the recent public meeting of ratepayers, which was held to consider the advance that has been made in the price of gas from 3s. to 3s. 4d. (see *ante*, p. 714). Having discussed the matter at some length, the Town Clerk was instructed to write to the Gas Company protesting against the increase in price, and stating that if the Directors of the Company would meet a deputation at the Town Clerk's office, the Council would be willing. In anticipation of the Directors acquiescing in this suggestion, the Mayor (Alderman Marsden) and the Chairmen of the various Committees were appointed to represent the Council. A further motion was agreed to, by which the Council "respectfully received" the resolutions passed at the public meeting, and promised to give their "earnest and earliest attention" to the matter. At the same meeting, the minutes of the Park and Lighting Committee contained a record of their proceedings in regard to electric lighting; and they stated their intention of instituting further inquiries in the matter before making a definite recommendation to the Council. A long discussion followed the reading of these minutes. The general opinion appeared to be that the Corporation should apply for a Provisional Order; and some members thought that, in view of the recent advance in price, the Council ought to take early action in the matter. The minutes were confirmed. The Committee who organized the public meeting referred to above have received a letter from the Yorkshire Water Gas Company, asking if they would make arrangements for a public lecture (with experiments) on water gas to be given in the town, with a view of demonstrating that this gas will produce a clearer and better light than coal gas at half the cost of the price charged in Barnsley. The Committee have forwarded the letter to the Town Clerk, inquiring if the Lighting Committee or the Council will take up the matter; and, if possible, allow the Company to demonstrate their system to the inhabitants.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

The Chief Gas Examiner for the Metropolis (Dr. Williamson, F.R.S.) has presented his report on the quality of the gas supplied by The Gaslight and Coke, the Commercial, and the South Metropolitan Companies, during the quarter ending Sept. 30. The following is an abstract:—

I. *With respect to Illuminating Power.*—The average illuminating power, in standard sperm candles, at each of the testing-stations, was as follows:—

The Gaslight and Coke Company—	
Jewry Street, E.C.	16·7
King Street, E.C.	16·6
Dorset Buildings, E.C.	16·6
Ladbroke Grove, W.	16·6
Devon's Road, E.	16·5
Carlyle Square, Chelsea, S.W.	16·2
Camden Street, N.W.	16·3
Graham Road, E.	16·7
Kingsland Road, E.	16·6
Spring Gardens, Charing Cross, S.W.	16·5
Grove Gardens, Regent's Park, N.W.	16·6
Hornsey Road, N.	16·9
Lambeth Road, S.E.	16·5
Millbank Street (cannel gas)	21·0
Commercial Gas Company—	
Parnell Road, E.	16·6
Wellclose Square, E.	16·4
South Metropolitan Gas Company—	
Foster Place, S.W.	16·4
Stoney Lane, S.E.	16·6
Lewisham Road, S.E.	16·3
Burrage Road, S.E.	16·5
Blackfriars Road, S.E.	16·2

It will be seen from these results that the average illuminating power at each station of the three Gas Companies was higher than the parliamentary standard (16 candles), and especially at the Millbank Street Station of The Gaslight and Coke Company. Slight deficiencies of illuminating power were reported during the quarter in the gas tested at the Jewry Street, Carlyle Square, and Blackfriars Road testing-places. The gas made by the Commercial Gas Company did not fall below the requirements as regards brilliancy even when weakest.

II. *As regards Purity.*—Sulphuretted hydrogen has not been present in the gas at any of the testing-stations. The average amount of sulphur present in the gas was considerably less than the quantity permitted—viz., 17 grains at all the testing-stations, and especially at the Devon's Road, Parnell Road, and Lewisham Road stations, where it averaged less than half that amount. An excess of 1 grain was reported on one occasion during the quarter at the Jewry Street, King Street, and Hornsey Road stations of The Gaslight and Coke Company. Ammonia has been generally present in the gas more or less frequently at all the stations; but only in slight quantities. The amount allowed—viz., 4 grains—was not exceeded on any occasion.

THE ELECTRIC LIGHTING SCHEME FOR THE CITY OF LONDON.

REPORT TO THE COMMISSIONERS OF SEWERS.

The long-expected report of the Streets Committee of the Commissioners of Sewers of the City of London on the subject of their electric lighting scheme, has at last been issued, and will be discussed at the meeting of the Commissioners next Tuesday. It contains the following remarks:—On considering the tenders sent in, together with the suggestions of the Companies in regard to conditions, it was found that the tender of the Anglo-American Brush Company was the only one practically in accordance with the specification; and, under the advise of Mr. Preece, the Committee instructed the officers to negotiate further with the Metropolitan Electric Supply Company and the London Electric Supply Corporation, with a view to arrange similar terms with them. This was done, with the result that they had severally modified the terms of their tenders so as to bring them into conformity with that of the Anglo-American Brush Company. Speaking broadly, all the three Companies now agree to accept the terms of the original specification, modified only in terms of the Provisional Orders last sanctioned by the House of Commons. The prices per annum per glass lamp are as follows:—The London Electric Supply Corporation, £24 3s. 10d.; the Metropolitan Electric Supply Company, £26; the Anglo-American Brush Company, £26. The London Electric Supply Corporation propose to extinguish half the lamps at midnight. After full consideration, the Committee recommend that the tenders of the three Companies be provisionally accepted, subject to their agreeing to enter into a contract for 21 years, determinable by either party at the end of 7 or 14 years, and the London Electric Supply Company waiving the condition as to extinguishing half the lamps at midnight; that the three districts into which the City is divided for this purpose be allotted as follows: No. 1 (west), to the Metropolitan Electric Supply Company; No. 2 (central), Anglo-American Brush Company; No. 3 (east), London Electric Supply Corporation. The Committee say that to light the main thoroughfares by the means of 395 arc lamps the cost would be £10,024, in place of 1730 gas-lamps, costing £5530 per annum; but while the price would not be double that of gas, the amount of light would be many times greater.

THE OXYGEN PROCESS OF GAS PURIFICATION AT RAMSGATE.

In the JOURNAL last week we briefly recorded the decision come to by the Ramsgate Corporation, at their meeting on the 2nd inst., to adopt as a permanent part of their gas manufacturing operations, the system of purification by means of oxygen devised by their Gas and Water Engineer (Mr. W. A. Valon, Assoc. M. Inst. C.E.), which, as our readers are aware, had been in use experimentally at the gas-works for about six months. As Mr. Valon has so recently, in the paper read by him at the last meeting of The Gas Institute, given to the gas engineering profession full particulars in regard to the nature of his process and the arrangements by which he carries it out (see *ante*, p. 41), it will not be necessary here to refer to details; our purpose being merely to report the remarks made at the meeting of the Town Council at which the recommendation of the Gas and Water Committee in favour of the adoption of the system was agreed to. It was a singular circumstance, in connection with this recommendation, as remarked last week, that the Chairman of the Committee (Mr. Alderman Pygott) should be the last member to give his sanction to it; and when he moved in the Council the confirmation of the Committee's proceedings, he explained the reason of his dissent, and told his colleagues that if he still thought he had sufficient ground for withholding his consent to the adoption of the process, he would continue to do so. Since the passing of the recommendation by the Committee, however, he had gone into the matter as fully and as carefully as

possible, and was prepared to withdraw his dissent. The following is the report of the discussion at the Council meeting:—

Alderman PYGOTT: I have looked at the matter in this way: As you are aware, the scheme is intended as an improved method for the purification of gas; and I daresay you will have noticed that even in consequence of the preliminary operations, the quality of the gas for some time past has been much better than previously. As Chairman of the Committee for the time being, I am anxious that the improvement in the gas should be kept up. At the last meeting of the Committee, I was not quite satisfied as to what the cost would be; the other members being more sanguine than myself. I had not the slightest objection to the recommendation in favour of the project itself, with the principle of which I entirely concur; but simply as to whether we should recoup the necessary outlay at the start. The sum of £1000 will be needed to put down the machinery required, including the producer and gasholder; and I now think that the whole of the interest on this amount, and the wear and tear of the machinery, will be met by the saving of expenditure for cannel coal hitherto rendered necessary to keep up the illuminating power of the gas. I am sorry to have in any way differed from the Committee, but I could not help it; and, in connection with any other question of the kind, until fully convinced of the wisdom of the step, I should feel it quite as much part of my duty to take up a similar position. A letter from Mr. Valon has greatly influenced me in my decision to support the scheme. Mr. Valon says that he entirely falls in with my suggestion as to the desirability of making the new system of purification recoup itself, and is confident that this will be the case. Further, he says that, from the experience he has already obtained of the valuable results accruing from the process, he is convinced that, after its final adoption, there will be a greatly improved quality of gas both in purity and illuminating power. I am, perhaps, not so sanguine as Mr. Valon as to the margin of saving; but I believe the system is the most perfect of the kind, and I am prepared to admit that it will greatly increase the purity and illuminating power of our gas.

A MEMBER asked what was the present consumption of cannel at the gas-works.

Alderman PYGOTT replied that he believed it was 234 tons last year; costing £438.

The MAYOR (Captain L. W. Vaile): That was the amount last year; but there has been none this year—cannel not being required for the oxygen system.

Alderman PYGOTT went on to say that the process was patented, and that the Company possessing the patent assured the Committee that for the first year they would not be required to pay anything, should they not, at the close of that period, be satisfied with the results. The royalty to be paid for the use of the patent was £1 per million cubic feet of gas made, which would come to £110 per annum, as they made 110 million cubic feet; but the Company were willing to forego this unless the Corporation were satisfied. Then, again, Mr. Valon was so confident of the success of the experiment—he (Alderman Pygott) still preferred to call it an experiment until it had been fully tested—that he had offered to remove the machinery, in the event of an improbable failure, without it costing the Corporation a penny. Alderman Pygott then explained, for the information of those members of the Council who were unacquainted with the oxygen process, the effect it has in the purification of gas, principally in the almost entire removal of the sulphurous acid.

The motion having been seconded,

Alderman PYGOTT, replying to questions, said there would be no necessity to borrow the £1000 required for the machinery, as it would be taken out of the reserve of £4000. With regard to the royalty, it could be compounded by the payment of a lump sum of £600 during the first year. As he had already explained, Mr. Valon was of opinion that, from the saving effected, the works would not cost anything either way.

Mr. VALON: I mean to say that the works will absolutely not cost the Corporation anything, and leave a large margin of profit.

Mr. PEARCE said, as a member of the Committee, and one who was quite convinced of the success of the system, he was prepared to bear half of the responsibility with Mr. Valon.

Alderman PYGOTT, in answer to a further question, stated that the oxygen system had not yet been permanently used by any corporation, although he believed works for its employment were being erected at Shrewsbury and other places.

A desire being expressed to hear what the Engineer had to say on the matter,

Mr. VALON said he had every reason to believe that there would be a margin of profit over and above the improvement in the illuminating power and purity of the gas. The increase in the former meant a large benefit. It must not be forgotten that the improvement in the lighting power of the gas to the extent (say) of two candles meant a reduction equal to 3d. per 1000 cubic feet in price; only instead of an actual reduction of their accounts, people would have the advantage in the light.

Alderman PYGOTT remarked that they could not charge any more.

Mr. VALON said no; but they could push the distillation further, and thus obtain an advantage. If it did not prove a direct benefit to the Gas Department in pounds, shillings, and pence, it would undoubtedly be appreciated by the consumers, and would redound greatly to the credit of the department. He believed he was right in saying that they would find a saving in the outlay required for the purification of their gas. He was not doing anything rash in advising the adoption of the system, as they had now had five or six months' experience of it. He was sorry to say that the experimental works, which were sufficient for the limited quantity of gas required during the summer, were not large enough to manufacture the oxygen needed for the winter; otherwise they might have even a better result than they had now. He had no doubt that the process would fully recoup itself for the outlay; and not only would it do so, but the illuminating power of the gas would be higher and the purity greater. They had thoroughly tested the system, and the gas had been as pure as that supplied by any other company in the kingdom, or anywhere else; while he could not assert that as good a system might not be discovered in the future, he could say that the system he was advocating would prove superior and cheaper to any other at present in use, and was by far the best process yet produced.

After some further remarks,

The MAYOR closed the discussion by expressing the opinion that they should adopt the process without further delay. Seeing that they had tried it for the past six months with appliances which were really too small, and it had been eminently satisfactory, they might, with new and adequate machinery, look for greatly improved results, and also anticipate a proportionate increase in their returns, so as to recoup the outlay incurred.

The motion was then put, and carried unanimously; and Mr. Valon was instructed to procure the necessary apparatus.

In the course of a letter we have received from Mr. Valon on the above subject, he says: "We have now had the experimental apparatus on a practical scale going at Ramsgate since last April; and the result has, I think, fully justified myself and the Council in coming to the conclusion that oxygen purification is very far in advance of any other system, and also that its application in reality costs nothing, as the saving gained in illuminating power, labour, and material leaves a large margin to its credit, even when lime and oxygen are compared with purification by oxide of iron alone. The latter process was the only one possible at Ramsgate, with the number of purifiers, and the only one that has been attempted to be used. In most instances, when introducing new ideas, difficulties crop up, and expenditure occurs which one did not imagine. In the oxygen process, however, these seeming difficulties have day by day disappeared. The apparatus which will be put up at Ramsgate will be entirely automatic. The steam-pump is governed by a perfectly automatic gear, pumping the air in and out of the tubes without a man having to touch it. The pump that does the work is no more formidable in the engine-room than an extra exhauster; and the whole of the attention required is to fill up the furnace of the producer three times a day, in the same way as the ordinary retort furnaces. Hitherto the tubes have been placed horizontally. They will now be placed in a separate producer vertically; it having been found that the results from the latter are superior to those placed horizontally, as the air is more evenly distributed, and it obviates any sagging of the barium so as to leave a passage along the top, which the air would take as the easiest way. The result of using oxygen during the last six months at Ramsgate has been to avoid using any cannel coal whatever; and although, owing to the increase in the make of gas, and the consequent decrease of the percentage of oxygen available, we have, as the boxes became foul, removed the lime, and substituted oxide in its place, the improvement in illuminating power and reduction in labour have proved conclusively that, even with the latter material—viz., oxide—there is a very great saving. It must, of course, be borne in mind that the quantity of oxygen put into the purifiers is not all absorbed. About one-half of it goes on with the gas into the holder; so this amount is sold at the same price as the gas. The cost of apparatus to produce a million cubic feet of oxygen is, as nearly as possible, what it costs to produce a million cubic feet of ordinary coal gas. At the expiration of a few months, I shall be able to speak positively as to the cost of producing the oxygen itself; but I have no doubt, from my own experience, that it will not in any case exceed that of ordinary coal gas. I think I need only add that, during the time we were using lime, we had no difficulty in keeping our gas to a maximum of sulphur of less than 10 grains." In a postscript Mr. Valon says the lime used for absorbing the moisture and carbonic acid from the air before passing it into the barium, is as active—indeed, more so—for the purification of the gas when removed than before it is put in; so that it costs nothing to purify the air beyond the labour, which is insignificant.

MR. J. W. HELPS ON EXTENDING THE CONSUMPTION OF GAS.

The subject of extending the consumption of gas has been a great deal under the notice of our readers during the past few months. Special attention was directed to it quite early in the year, by the publication in our columns of a letter from Mr. W. A. Valon, Assoc. M. Inst. C.E., the Gas and Water Engineer of the Ramsgate Corporation, setting forth the scheme proposed by him for adoption in that borough. That scheme, it will be remembered, was approved by the Town Council, and is now in operation. Only a few weeks ago this question was discussed in the paper read by Mr. J. Carter, of Lincoln, before the Eastern Counties Association of Gas Managers; and it formed the subject of the valuable contribution to the transactions of the North of England Association which Mr. J. H. Cox, jun., of Sunderland, laid before the members at their recent meeting, and given in our "Technical Record" in last week's issue (p. 695). In view of these facts, it may be of interest to reproduce the main portions of a report on this subject which Mr. J. W. Helps, Engineer and Manager of the Croydon Gas Company, has presented to his Directors; his suggestions being possibly of value to managers of gas undertakings in towns similarly circumstanced to Croydon.

Mr. Helps commences by calling attention to the powerful rival which coal gas now finds in oil, the increased employment of which for the lighting of shops, public-houses, &c., in Croydon has been very noticeable. This has, of course, affected the consumption of gas, although there had not at the close of last year been any falling off. Comparing that year with 1883, there had, in fact, been an increase of 10·32 per cent. in the number of consumers, and of 26·50 per cent. in the quantity of gas burnt by each of them. Mr. Helps gives some statistics for the six years 1883-8, which show that the position of the Company at the date of his report was due rather to the increase in the quantity of gas used by existing consumers for purposes other than lighting than to the spread of the use of gas as an illuminant. That there was room for an increase in this direction is shown by the fact that, out of about 16,500 houses in the Company's district, gas was used in about 6000 only; leaving 10,500 upon which to work. In 1883 there were only 246 cooking-stoves on hire; in 1888 there were 778, or more than three times the number. These are quite independent of the stoves purchased outright either from the Company or from other dealers. When Mr. Helps made his report there were, in addition, a large number of heating-stoves and gas-fires in use, as well as upwards of 40 gas-engines. He took 60 cases at random, and found that the average increase in consumption per customer due to the adoption of gas for cooking and heating purposes was 61 per cent. This explained the high increase on the average consumption, and, to his mind, pointed out two things—that not only were the Company failing to introduce gas to any extent into houses not previously supplied with it, but were actually losing part or the whole of the custom of those consumers who had already purchased it. It behoved them, he thought, to consider the reasons for this state of things, and the best means of effecting an improvement therein. Mr. Helps proceeds to discuss these questions, as follows:

In the past, there is no doubt that gas companies have practically held a monopoly in the lighting trade; but to-day such is no longer the case. Oil is cheaper, better, and safer; and the lamps in which it is burned are so vastly improved, that there is no gainsaying the fact that lighting by oil is at least as cheap and as effective as lighting by gas by the ordinary and old-fashioned methods. But have these facts been realized by gas companies, and have they arrived at the conclusion that they must enter into active and commercial competition with rival purveyors of illuminants? It appears to me that, so far, they have not done so, or, if at all, to only a trifling extent.

There are so many hindrances placed in the way, that frequently it is a matter of no small difficulty to obtain a supply of gas. With the occupiers of the larger houses this is not perhaps so severely felt, either on the score of inconvenience or expense; for it is, I am glad to say, becoming the practice with builders to put into the better class of houses the necessary pipes and connections at the time of building, and to apply to the Company for a service-pipe. But in smaller houses, such as those in the occupation of respectable artizans, &c., how difficult and expensive

does the matter become. The house has to be fitted up, the service-pipe laid in, and probably a deposit paid, before the would-be consumer can obtain his light. This necessitates a considerable outlay—probably more than the tenant can afford. Nor does the inconvenience end here. The gas account is collected quarterly, and, as a rule, the sum owing at the end of that period is a comparatively large one, and more than the consumer is able or willing to pay at the time it is demanded; for, in nine cases out of ten, such a thing as putting by a certain sum for this purpose weekly has never been thought of, or, if thought of, acted upon.

What a difference in the case of oil. A man purchases a good lamp for a few shillings; and his weekly supply of oil is brought to his door. Of course, it is well known that his trouble does not end here; for he has still to pay a certain amount of attention to the lamp daily. But surely it must be owned that the process of obtaining his light is infinitely simpler and far less expensive than it is with gas. Then take the case of a shop or public house. The tenant has gas, but wishes for a more brilliant effect than he is able to obtain from it as consumed through the ordinary burners. He probably has not many inquiries to make, or takes much trouble in carrying out his desire. An agent of some oil merchant, or firm of oil-lamp makers, calls upon him; and by offering him liberal terms of payment, and by drawing a vivid picture of the advantages to be obtained, succeeds in selling him a handsome lamp, which in a short space of time, and at little expense or trouble, he has hanging in his shop or bar, throwing utterly into the shade the puny efforts of the poor gas-burners, and naturally giving rise to the assertion that oil is both a cheaper and a more effective illuminant than gas—it being, of course, lost sight of that the very highest development of oil lighting is here being compared with a somewhat old-fashioned and crude method of gas illumination. Meanwhile, the Gas Company has been content to look on at this process of substitution—suggesting no advice, and making no offers of assistance towards obtaining an even better and cheaper effect through the medium of its own commodity. Of the after-inconveniences of the oil-lamps I will say nothing. Sufficient be it that the shopkeeper or the publican has obtained, with little difficulty, an excellent light, and that this light means the diminution of his gas account.

I think I have shown that it is much easier and less costly at the outset to obtain a light by means of oil than by gas. So far I have said nothing about electricity, as in Croydon but little has yet been seen of this powerful, but expensive illuminating agent; but I believe that the same means which will, in my opinion, stop the spread of oil, will prevent the adoption of the electric light to an appreciable extent.

I will first deal with the supply of gas to those houses which are at present without it, and more especially those of a yearly rental below £30 per annum. Of these there are in Croydon a large number, and comparatively few of them (only about 21 per cent.) are occupied by consumers of gas. It may be urged that the occupiers of the smaller houses —for instance, respectable artizans—are undesirable as customers, not being permanently resident. But I find that those workmen whose habits are somewhat migratory do not themselves rent houses, but usually lodge with those who do; and it is with these latter that I propose to deal, and in the following manner:—I would suggest that the Company should offer to supply and fix the necessary pipes and fittings to any house of a certain size, from the occupier of which an application had been received—of course, upon the fulfilment of certain conditions. Now, the cost of doing this, including a 3-light meter, one pendant for the front room, another for the back room, one bracket for the kitchen and another for the passage—all the burners being governed—would be about £3 10s. These fittings would be of uniform pattern, and stamped with the Company's initials. A sum of 8s. per annum would cover the rental of the above fittings and meter, and would necessitate a charge of 2d. per week, or 8d. a month. The fitting need not be undertaken by the Company's workmen, but might be let to a repectable and capable fitter, or firm of fitters, who would, of course, be empowered to carry out on their own account any further work which the occupant might desire, in addition to that which I have specified. To encourage the use of gas for cooking, I should like to see a small cooking-stove sold to the consumer upon easy terms, and fixed without charge, or even lent free of cost. In an ordinary artizan's house, it is estimated that the yearly account for gas consumed, including the before-mentioned 2d. per week, would be a little over £2. Of course, in all cases it would be advisable to get the written consent of the landlord before interfering with the house, and his acknowledgment that the fittings and fixtures were the property of the Company, and not liable to seizure under distraint for rent. The accounts would be collected monthly, or even weekly; and I would suggest that this should, at any rate at first, be done independently of the ordinary collectors. For instance, the inspector would take the index of the meter, hand it in at the office, where the account would be made out, and returned to him for collection. This could, I think, be done at odd times, and without much interference with his other work. The mode of payment might be by a commission (say) of 5 or 2½ per cent. The consumer would sign a weekly contract; so that the Company could, in the event of payment being delayed, close the account at short notice. There are in the market several prepayment meters, the use of which provides for the sale of any desired quantity of gas on payment being made in advance. This amount cannot be exceeded until a further payment has been made; and a very simple contrivance has been invented and patented by Mr. W. A. Valon, of the Ramsgate Gas-Works, which promises to fulfil all requirements. Should this be borne out in practice, I would certainly recommend that meters of this description should be adopted in place of the monthly or weekly collections mentioned above. In the event of these suggestions being carried out, it would be well to advertise the proposals in the local press, &c., and to let it be known that the experiment would be made with only a certain number of houses—say 100 or 200—and that applications would be attended to in the order in which they were received.

I then come to the question of providing improved lighting in those establishments where provision is already made for obtaining the necessary supply. I have before referred to the method adopted by purveyors of oil and oil-lamps; and I would certainly recommend that the Company should follow somewhat on the same lines. The ordinary consumer fails to discriminate between a poor light arising actually from the bad quality of the illuminant, and one caused by the improper combustion of a gas of good illuminating power in a faulty burner or under unfavourable conditions. The one phrase "bad gas" is applied in both cases. And here I cannot refrain from remarking that much harm is done to gas companies by the utter ignorance of the principles of their trade displayed by many so-called gas-fitters, who, on being called in to investigate a complaint of a bad light, are frequently unable to recognize its real cause, and accordingly cover their ignorance by wild statements about the quality of the gas, and the prevalence of similar complaints. In nine cases out of ten, the Company's inspectors are able, by pointing out some defect in burners, globes, or fittings, to prove the fallacy of such remarks; and either to provide for the consumer a sufficient illumination, or to point out to him the means by which such a result may be obtained.

Now, it is a fact that, by simply changing the burner, or the burner and globe, it is possible to cause 5 feet of so-called 15-candle gas to give a light equal only to 5 or 6 candles, or to increase it to that of 50 or 60 candles; and thus, in the eyes of the consumer, to produce from identically the same article a bad light, a fairly good one, or an excellent and even brilliant illumination. But how are our customers to obtain the benefit of this fact? Well, my opinion is, that our Company should take steps to provide a place where various kinds of burners could be exhibited, tested, and compared; and advice given as to the description most suited for the special requirements of the consumer. Again, it behoves the Company to deal very liberally in the matter of burners—to sell them as cheaply as possible, if not to actually give away the cheaper kinds. With regard to the more expensive burners—such as the Wenham, "Meteor," Schülke, Siemens, &c.—I believe much good would arise from actually canvassing for orders amongst publicans, shopkeepers, &c., and making offers to provide and fix these burners on approval. I may say that we have already tried this on a small scale, and almost invariably the burner has been retained, and not unfrequently others have been ordered—in many instances to the exclusion of oil-lamps, till then in use. Easy terms of payment might be offered—say, the addition of a certain sum to each quarterly account, to provide for the full payment within a specified time. This sum would also cover the bare cost of fitting if thought desirable.

Then comes the question of gas for cooking, heating, motive power, &c.; and I think there are few towns where greater progress in this direction has been made than in Croydon. This is, in my opinion, due in a great measure to the liberal policy adopted in letting out stoves on hire and fitting them up free of cost. In 1880 we had on hire 104 stoves; and in 1884, 277. In 1885 we commenced the system of fixing them free; and in the same year we held an exhibition of gas apparatus. In consequence, at the end of the year we had on hire 524 stoves; showing an increase over 1884 of 247 stoves, or eight times the increase of 1884 over 1883—viz., 31. On Dec. 31, 1888, the number had reached 778. These figures are, as already mentioned, entirely irrespective of those stoves either sold direct by the Company or purchased from other dealers. But when it is remembered that we have upwards of 6100 consumers, and frequently one consumer has several stoves, it will be seen that there is considerable room for improvement.

Mr. John Somerville, in his presidential address to the members of the Southern District Association of Gas Engineers and Managers, in February last, said that during the summer of 1888 the South Metropolitan Gas Company held 20 exhibitions, with the result that the net increase of cooking-stoves in use over the previous year was 2192, or more than double the increase of 1887 over 1886. About 860 direct orders were received at these exhibitions; and during the last three months of the year, 257 heating-stoves were sold direct from the Old Kent Road Offices. Now, I certainly think that another exhibition of gas appliances would be of great benefit to the Company, and would be the means of giving a much-needed impetus to the letting out and selling of gas cooking and heating stoves, &c., in the district. [This exhibition has since been held, with excellent results, and a large show-room, &c., is being erected.] But it is not enough to show the people who attend the exhibition the various appliances, and to tell them what can be done by their use. Something more is needed to keep the matter constantly before the public; and I cannot help reverting to a report I presented in November, 1887, in which I advocated the erection of show-rooms, &c., where the various kinds of stoves could be seen, and, if necessary, tested. At present our accommodation is far too small; and this fact, I feel assured, stands in the way of our doing such a business in the disposal of stoves, &c., as I think we could reasonably expect with improved facilities for bringing them prominently into notice. [This suggestion has been adopted; and a large show-room is now being erected.]

I wish now to bring before you what I consider to be a most important point, and that is the question of deposits. Of course, I feel that it is hardly possible to do away with them altogether; but I think that it is highly desirable that the system should be reduced to the smallest limits. On this subject I must again quote Mr. Somerville in the address already alluded to. He says: "I may mention that the South Metropolitan Company gave up asking for deposits from occupants of private houses last year, and have returned about £10,000 in deposits to other customers; and the last half-year's accounts show £114 less bad debts—a proof that more efficient collection of accounts is equal to, or better than deposits." Again, Mr. George Livesey, in speaking at the meeting of the Commercial Gas Company on April 5 last, said, amongst other things: "That system [*i.e.*, deposits] has been worked too much in times past. I think gas companies are quite aware of the fact; and they are not exacting such deposits now, where they can be avoided. . . . The abolition of all deposits where possible, the giving facilities for services without cost to the consumers, and helping them in the way of fittings—that is what we should do. I think the time is coming when gas companies should supply fittings." And the Chairman, in noticing the above remarks, said: "As regards deposits, the Board of the Commercial Gas Company are quite alive to that point." A strong argument in favour of the abolition of the system is contained in a paragraph appearing in the JOURNAL OF GAS LIGHTING for April 9 [p. 667], which states that the Chairman of the Gas Committee of the Bolton Corporation said that, since the introduction of the new regulation abolishing deposits, they had attached service-pipes to upwards of 1300 cottages which had not previously been supplied. But even if, by doing away with deposits, bad debts were to slightly increase (which I do not believe would be the case), I scarcely think it would be difficult to show that the profits arising from the consumption of gas by those who object to use it on account of the levying of deposits, would considerably more than make up for any loss so sustained, without taking into consideration the increased stability of the Company which would be brought about by the additional consumers. One thing is certain, deposits form a hindrance to the sale of gas, and every effort should be made to bring about their partial, if not total abolition; but if such be accomplished, it is necessary to suggest some means of obtaining the result that their imposition is intended to produce. I will name the following:—(1) Reference from other gas companies; (2) reference from bankers or others; (3) monthly or weekly payments; (4) prepayment meters.

Mr. Helps concludes his report by briefly summarizing the proposals contained therein, most of which have been adopted, and are now being, or have already been carried out.

NOTTINGHAM CORPORATION AND ELECTRIC LIGHTING.—The Electric Lighting Committee of the Nottingham Town Council reported to that body yesterday week that they had had under consideration the notices which had been given by several companies of their intention to apply to the Board of Trade for Provisional Orders to supply electric light. The Committee were of opinion that the time had arrived when electric lighting should be introduced into the town; but they recommended the Council to undertake the supply themselves, and to take all necessary steps to obtain a Provisional Order authorizing them to supply electricity. The report was adopted; and the members agreed to hold a special meeting on the 11th prox. to consider the whole subject.

THE GAS SUPPLY OF DUBLIN.

The Recent Dispute between the Corporation and the Alliance Gas Company.

In the Journal last week we reported the proceedings in the arbitration which was opened on Monday, the 30th ult., between the Dublin Corporation and the Alliance and Dublin Gas Company, to settle certain questions—mainly in regard to the public lighting—which had been in dispute between them, and had been referred to arbitration by an order of the Court, and a deed of submission executed by the contending parties. Considerable importance attached to these proceedings; and therefore our readers will probably find the following statement of the case (which we have received from a correspondent) interesting in connection with what has been already published in our columns:—

There were two separate and distinct issues to be tried and determined by the Arbitrators. The first was in connection with the action referred to them from the High Court of Justice in Ireland, for them to bring about a settlement in connection with the amount which the Corporation had deducted from the Company's amount for the public lighting. The items in this account were: (1) for deficiency in illuminating power; (2) for deficiency in the quantity of gas supplied to the lamps; and (3) for not keeping the lamps, governors, &c., in repair according to contract. This question had been before Baron Dowse and others on two or three occasions, and, it will be remembered, was surrounded with endless technical and other difficulties for them to unravel.

The second and more important question was as to the arrangement of price and the methods to be employed in connection with the public lighting of the city in the future, and also the testing-station and purity of the gas. The Corporation have been desirous for a long time past to have this question settled. It may be stated that in 1866, when the amalgamation of the several Gas Companies in Dublin took place, a contract was entered into by the Corporation and the Alliance Gas Company for ten years; and clauses were inserted specifying that if at the end of that time a further agreement was not entered into, the Corporation were to have gas supplied to them at the lowest price charged to any private consumers. From this period up to 1880 special arrangements were made whereby the Corporation were always allowed a very considerable reduction; but in that year an agitation was got up in the city and Council on behalf of the private consumers—the general opinion at that time being that they ought to have some of the advantages that were being obtained by the Corporation. The Corporation therefore decided to place themselves on the same footing as the consumers, and requested from the Company an all-round reduction, which was granted. In the year 1883, however, the Company applied for additional powers, and embodied the standard price with sliding scale; and, of course, it was assumed that the local authorities and private consumers were all being charged alike. But it came to the knowledge of the Corporation that the Company were granting a discount to the extent of 10 per cent. to some of their large consumers; and inasmuch as the Corporation were taking from the Company for public lighting about 70 million cubic feet of gas per annum, they considered that they ought not to pay more for their gas than the lowest price charged to private consumers. The Corporation have repeatedly requested the Company to allow them this discount; but the latter have resisted their appeals, and maintained that, inasmuch as they had the standard price with a sliding scale, this question could not be arbitrated upon, as the price was defined by statute.

Another of the Corporation's chief contentions was that the gas could not be properly tested at the present testing-station in Burgh Quay; and that it had been frequently reported by the Gas Examiner appointed by the Corporation on behalf of the City, as being considerably below the illuminating power required by the Acts of Parliament. These tests, however, were made at two stations—one being what is considered as the official testing-station; the other belonging to the Corporation near the gas-works—and it was frequently found that the testings were not in agreement with each other. The Corporation therefore requested that a new site should be chosen, so that a more suitable station could be erected, and the whole of the gas supplied to the city more efficiently tested.

Another important question was the extraordinary method employed in Dublin for carrying out the details of lighting, cleaning, and repairing the plant in connection with the public lighting; the arrangement being such as would probably not be found in any other city or town in the United Kingdom. Strange to say, the lamps, columns, meters, and all the plant in the city, are the property of the Company. The general, and it may be said invariable practice in England, as your readers may be aware, is that the plant belongs to the local authority, and the gas company enter into a contract with them to supply gas, light, extinguish, repair, maintain, paint, &c., for a fixed sum per annum for a definite number of hours; or the company simply supply gas, and the local authority light, clean, extinguish, supply meters and other apparatus, and keep them in repair themselves. In Dublin, however, one finds that matters are truly Irish, and that the Company not only supply gas upon the average meter system, but contract with the Corporation to keep the lamps, meters, and governors in repair for 4s. 6d. per lamp per annum, and the Corporation provide men to do the lighting, cleaning, and extinguishing. The contention of the Corporation has been that the Company have not kept the apparatus in proper repair; whereas the Company state that the lamplighters supplied by the Corporation have not been so careful with the lamps as they ought to have been. This absurd triple arrangement has for a long period caused a considerable amount of "friction" and annoyance to both parties, which no doubt has arisen from want of proper apparatus, and definite rules and regulations being laid down.

This long series of contentions between these two public bodies led them both to the conclusion that the matter ought to be settled; and some months ago the Corporation engaged Mr. John West, C.E., of Manchester, to make a complete examination of the existing arrangements, test the illuminating power and purity of the gas, and submit recommendations in regard to the future method of supply. In pursuance of his instructions, Mr. West in March last proceeded, in company with one of the Aldermen, to the Gas Company's offices, and asked permission to inspect the works and everything in connection with the distributing plant for supplying the city. To the great surprise of the Local Authority, the Company's Secretary (Mr. W. F. Cotton) immediately gave the desired permission, and requested the Company's Engineers to render him any assistance he desired. This, of course, led to a thorough investigation. The ground was opened on the works and in certain parts of the city, so that Mr. West could thoroughly satisfy himself as to how the city was supplied. The particulars obtained he marked on several maps, which were produced in Court. He also on several occasions tested the gas at the two testing-stations, in the presence of various officials; and it would be interesting to know what he would have had to say on these important matters. However, they are all now a "closed book," seeing that an agreement has been arrived at between the parties. Dr. Teed, of London, one of the gas examiners, also tested the illuminating power of the gas on several occasions; and other experts were called in to bear testimony to the defectiveness of the governors, lamps, meters, &c.

It was thought that, from the importance of the questions at issue, a long time would be occupied in examining and cross-examining the expert witnesses on both sides; but just before the Arbitrators took their seats, it was rumoured that the Company suggested a conference. This produced a flutter in the Court; and the Counsel, Aldermen, and Mr. West were seen in consultation, duly formulating their views. Eventually, as your readers are aware, an outline of an agreement was arrived at; the Corporation deciding to pay the account which had been in dispute, on condition that the Company would supply the lamps from July last at a reduction of 10 per cent., remove the old, and fit up a new testing-station on the site recommended in Tara Street, and agree to sell the lighting plant to the Corporation, so that in future they could maintain and keep it in repair themselves.

After this general agreement, each party had to consider other matters of detail; and they met again on the following morning, when Counsel asked the Arbitrators to allow them a few minutes' time. They were, however, two hours before they finally settled their differences; but during this period negotiations broke off, and war was declared—the Corporation appearing in Court and taking their seats ready to commence the battle. In a short time, however, they were sent for (common sense having prevailed); and they all appeared in Court to lay their decision before the Arbitrators, with instructions for them to find on certain matters. There was, however, still a strong contention as to the site of the testing-station, as well as in regard to the sulphur clauses. The Corporation maintained that the proposed station was most suitable; also that the sulphur clauses were in force. After arguing this point, it was admitted by the Company that they were bound to remove the objectionable impurities, which they had not done before. The Umpire and Arbitrators were asked to inspect the site in company with Mr. West and the Gas Examiner (Mr. T. J. Cotton) on behalf of the Corporation, and the Secretary and Engineer of the Gas Company and Dr. Tichborne. An adjournment took place until half-past three, when the Umpire and Arbitrators informed the Court that the proposed site, in Tara Street, for the new testing-station was a suitable one. The proceedings then closed by the Umpire complimenting all parties upon the honourable way in which they had settled their differences.

The result of all this contention is that, on the one hand, the Gas Company have been paid the disputed account in full; and, on the other, the Corporation have succeeded in getting the full abatement they have asked for—viz., 10 per cent.—on the future supply of gas to the city, the removal and partial control of the testing-station, and the whole of the lighting plant, so that the differences which have arisen heretofore will be avoided in future.

At the Meeting of the Dublin Corporation on Monday last week—the Lord Mayor in the chair—a long letter from Alderman Dillon (on behalf of the Special Gas Committee), dealing with the subject of the proceedings above epitomized, was read by the Town Clerk. It commenced by giving a short account of the Committee's labours since their appointment. They were charged with investigating all questions relating to the public lighting of the city; and this they did with the assistance of the Corporation's Lighting Inspector (Mr. T. J. Cotton). At the very outset they found that it was necessary to have a thorough change in the existing arrangements, and that there were three principal questions involved. In the first place, they were convinced that, so long as the average meter system was deemed to be the best one as the basis of charge for gas supplied to the public lamps, the dual control exercised by the Corporation and Gas Company respectively over the lighting plant could not, with any satisfaction, be continued. That system had led to much unpleasantness between the Corporation and the Company; and the result of the Committee's investigations was a determination to continue the meter system, but to acquire from the Company the plant and appliances necessary for working it. Passing to the second question, the Committee found that the gas-testing station provided by the Company was altogether inadequate, and that very insufficient tests had been made; the sulphur compounds being altogether neglected. These facts led the Committee to determine upon seeking to change the site of the station, and upon requiring the Company to supply new and improved apparatus for testing the gas both for illuminating power and purity. Coming to the third matter in dispute—the allowance of discount to large consumers—the Corporation had put before the Company their claim, as providers of the public lighting, to be placed on the same footing as those consumers; but it had been rejected. Considerable correspondence took place between the Committee and the Company on these three questions; but no satisfactory arrangement could be come to. As a means of raising the issues and having them determined by a proper tribunal, the Committee refused to pay the accounts as furnished for the three quarters ending Jan. 5, 1889; and, in the event, they were sued by the Company for the amount. The Committee defended the action on the grounds that the illuminating power of the gas was not up to the standard; that the Corporation should have the benefit of the reduced charge to large consumers; and that the public lamps were not supplied with proper burners and regulators. At the same time they paid £5000, a portion of the Company's claim. These matters, as our readers are aware, were submitted to arbitration, in conjunction with others relating to the conditions of the future supply and consumption of gas to and by the public lamps, the site of the testing-station and the adequacy of the appliances for testing gas, and the future price to be paid for the gas supplied for the public lighting. The proceedings which led up to the reference are all fully set out in the Committee's letter; but as they are by this time familiar to our readers, they need not be reproduced here. They set out the agreement eventually come to, as published in the Journal last week; and conclude by claiming that all the important questions raised by them have been fully and entirely decided in favour of the Corporation, and that disputes which have lasted for years have been happily terminated, and friendly relations, which they trust will long continue, re-established between the two disputing bodies. The High Sheriff moved that the letter be printed and circulated among the members. Alderman Dillon, in seconding the motion, explained that when the result of the arbitration proceedings became known, unfavourable comments appeared in the public prints, and an idea seemed to prevail that the Corporation had not succeeded in establishing their case, and had not gained any concessions from the Company. The Committee were not obliged to send in any report to the Council; but they thought that the sooner their views were put before the public, the better it would be for the interests of all parties. It would be seen from the letter that the Committee had obtained very important concessions for the Corporation; and the further advantage had been gained—which personally he felt to be an extremely great one—that all bickering and unpleasantness between them and the Company would be put an end to. Mr. Miley, referring to the undertaking given by the Corporation to purchase the public lamps from the Company, questioned the advisability of the arrangement, in view of the progress of electric lighting. He suggested that if the undertaking were not binding, the Council should have an opportunity of discussing it; but not until the letter had

been printed. Alderman Dennehy characterized as "silly" the entire action of the Committee, which, notwithstanding a large expenditure for costs, had, he said, been attended with so miserable a result. Mr. Mayne said there was no possible way of satisfactorily getting out of the difficulty in which the Corporation had been for so many years with the Company but by purchasing the existing lamps. Mr. M'Donald pointed out that the price to be paid for the lamps remained to be decided by two Arbitrators; and until this decision had been arrived at, the question ought not to be further discussed. He thought a great advantage had been secured by taking over these appliances, for now the Corporation would have the lighting in their own hands. Alderman Perry proceeded to controvert statements which had been made with regard to the action of the Committee. He said that so far from the Corporation not having been anxious for arbitration, they submitted a deed of arbitration to the Company so far back as the 30th of March last. The Committee had now gained all they then asked the Company to concede. It had been asserted that the Corporation had failed. They had not—they had succeeded; and he believed that when the award of the Arbitrators was published, the result would give satisfaction to the Council, the ratepayers, and the city generally. The motion was then unanimously agreed to.

THE STRIKE AT THE BRISTOL GAS-WORKS.

Up to the time of going to press with last week's number of the JOURNAL, no tidings were received of a friendly settlement being come to between the Directors of the Bristol United Gaslight Company and their workmen; and as our notice of the dispute indicated, there was every likelihood of its being brought to a crisis on the following day—there being no appearance of submission on either side. As we mentioned last week, the stokers asked for an increase of wages of 8½d. per day. This the Directors were willing to concede, provided the men would undertake to carbonize an additional 16¼ cwt. of coal per man per shift. This was the sore point; and the men were unanimous in determining not to accede to this offer. A week's notice was given to the Directors by the whole of the stokers and yardmen employed; and forthwith both parties proceeded to make great preparations for the approaching struggle. The Directors had tents erected at the Canon's Marsh and Stapleton works for the accommodation of the men who were to take the place of those who went out; and the harness room at the Avon Street works was called into service, and fitted up for the same purpose. A quantity of food and beer was also stored; and the officials obtained assurances from a large number of men from other towns that they would work for the Company if required. On the other hand, the men made the usual arrangements for carrying on a fight of this character; and they were backed up by promises of support from the London Gas Workers' Union.

The struggle commenced in real earnest on Tuesday evening, when, in accordance with their notices, the first shift of stokers and coal wheelers left work. They were paid off without anything exceptional transpiring. On the same evening, so the men declared, new hands were introduced into the Company's stations; but upon this being noticed by the stokers on duty, they immediately threw down their tools and ceased work—demanding that the objectionable hands should be removed. This request was immediately complied with; and the men resumed work. At six o'clock on Wednesday morning, the second shift left work; and at two o'clock on the same day, the third shift was paid off. As the men composing the last shift emerged from each of the Company's stations, they were boisterously welcomed by their assembled comrades. As the day advanced, the crowds in the neighbourhood of the works gradually expanded; but there was little disturbance, until about half-past five, when the police stationed at Canon's Marsh had their first serious encounter with the men. At the hour mentioned, a break drawn by four horses, containing men who had been engaged by the Company, managed to drive down Gas Lane; but when at the bottom, the strikers rushed at the leading horses, and turned them round. A tough struggle ensued between the police and the men, which resulted in the former succeeding in getting the vehicle into the Company's yard—not, however, before the majority of the occupants had been roughly treated. Another conveyance arrived while the attention of the mob was devoted to the first one; and this managed to get into the yard without much difficulty. These breaks, it is stated, came from Weston-super-Mare. A third break attempted to convey men into the yard; but it had to return after a sharp tussle, in which the men on both sides sustained injuries. After these disgraceful scenes, the mob rapidly increased until, it is computed, there were above 2000 persons congregated in the thoroughfares surrounding the works. Early in the evening about 100 men arrived by train from Falmouth, Exeter, and other places. A strong force of police conducted them to half-a-dozen breaks which were in waiting. A large crowd, inside and outside the station, hooted and hissed as the breaks moved off with police marching in front and behind each one. When near Marsh Bridge, the conveyances were met by a solid body of many hundreds of men, who had taken possession of the bridge and its approaches so effectually that it was at once evident the breaks would never get through. The hooting and shouting were deafening; and the new comers were assailed with a shower of stones. A rush was also made for the breaks; and though the police did their best, they were utterly unable to grapple with the mob, or to do more than stand round the vehicles and get the men out and back to the station as speedily as possible. Those in the first break suffered severe cuts and blows from missiles; and several of them had to have their wounds dressed by a medical gentleman before returning home.

In the course of the afternoon, a very grave incident occurred near the Avon Street works. A cab containing three persons, supposed to be "blacklegs," approached the works; and the occupants were accosted by the men on picket duty, with the result that, after a brief conversation, the cab was overturned with the men inside. Whereupon one of the three—whose name has since been ascertained to be William Browning—drew a revolver from his pocket, but dropped it upon the seat. A second man, named Young, picked it up, and a scuffle ensued. One of the men (it is not quite certain which) aimed the weapon at the head of a stoker named Bennett, who was taking a prominent part in the scrimmage, but before he could pull the trigger, Bennett threw up his arm, so that when the pistol went off the ball passed through his hat an inch or so above the brim. Browning and Young were both arrested; but the third man escaped. Later in the day about sixty men arrived by train from Newport, sixty from Liverpool, eighty from Hereford, and fifty from Radstock and Chew Magna; but these, on being informed of the state of affairs, and the kind of reception which had been accorded by the strikers to those who had preceded them, refused to leave the railway station, and as many as possible were subsequently despatched to their homes. It is alleged that the bulk of these men were invited by the Company to Bristol on the understanding that they were to be paid good wages to labour at new works; but how far this is true, we cannot say.

During the evening the Chairman (Mr. Vicary) and three or four members of the Strike Committee had an interview at the Avon Street works with the Secretary of the Company (Mr. J. V. Green), the Engineer of the works (Mr. E. J. Lloyd), and the Company's Solicitor (Mr. Brittain); and it was rumoured that there was a probability of an early settlement being arrived at. On the following morning, the Directors met a deputation of the men; the result being that the Board agreed to make certain concessions, which the representatives of the men considered sufficient to justify them in advising their comrades to return to work. The original demand of the men was: Stokers to have an increase of 8½d. a day, making 5s. a day; wheelers to have their wages raised to 4s. a day; and yardmen to 3s. 6d. a day. The men further demanded a week's holiday in the year, and time-and-a-half on Sunday. Early in the negotiations, however, this last demand was withdrawn; but the men pressed for the increase and the holiday. The Directors conceded the advance to all three classes, and also the week's holiday. Many other minor details were arranged to the satisfaction of all concerned; and the men determined to return to work, and continue as if nothing unpleasant had occurred. Soon after the announcement of the agreement was made, the works assumed their normal appearance; and the men proceeded about their accustomed tasks. Work, however, was not resumed any too soon; for at the Avon Street works, which supply the whole of the city proper, the store of gas had run extremely low—so much so that even with assistance from the holders at Stapleton Road, the supply could not have been continued after midnight. The concessions made by the Directors will cost, it has been estimated, about £5000 a year; and to meet this extra outlay, it is supposed that the reduction of 2d. per 1000 cubic feet, which was recently made in the price of gas, will be cancelled at the end of the current quarter. The Directors state that they had made adequate arrangements to carry on their business. They received applications for employment from many more men than they required; and complain that efficient police arrangements were not made. They had engaged a sufficient number of hands to keep up the supply of gas; but when these arrived they were prevented from reaching the works by the mob. The Directors also declare that they were most desirous of doing all they could to prevent a recurrence of the unpleasant scenes which were witnessed on Wednesday evening; and while still believing they were justified in the course they had taken, they realized that they had the interests of the public to protect, as well as those of the shareholders, and hence they came to the conclusion to again meet the men with the view of settling the dispute. The Weston-super-Mare men quitted Bristol early on Thursday morning; and the men from Liverpool, Hereford, and other places who could not leave the previous evening, were allowed to remain at the railway station the whole night, and permitted to return to their respective towns by the first trains, without payment. It is believed, however, that the Railway Company intend to send in a claim to the Gas Company for the tickets thus issued.

The two men (Robert Young and George Browning) who were arrested in connection with the shooting incident near the Avon Street works on Wednesday were brought up at the City Police Court on Thursday, charged with unlawfully having in their possession a loaded revolver, and threatening to shoot Daniel Smallbridge; the revolver at the time being loaded with ball cartridge. The defendants were bound over in their own recognizances to attend the Court to-day (Tuesday). At the Lawford's Gate Petty Sessions on the same day, there were two or three charges of assault arising out of the disturbance on the preceding evening. A man named Bruton was sent to prison for two months, with hard labour, for assaulting a police constable; and for similar offences Henry Hubert was sentenced to six weeks' imprisonment, and Albert Jay was fined 10s. and costs.

A correspondent, who is perfectly familiar with all the circumstances of the recent agitation at Bristol, sends us the following for publication, headed—

Brickbats at Bristol.

The dispute between the Directors of the Bristol Gas Company and their retort-house *employés* has been settled for the time by the men securing (with a slight exception) the terms which they demanded. And it has been settled in a manner that seems somewhat like a return to primitive and barbarous times. The Bristol stokers evidently are not in need of anything like a Union; and the eloquence of Messrs. Burns and Tillett is quite a superfluity in that city. The weapons by which they have secured their ends are treachery and——brickbats.

For some reason or other, with which I am not now concerned, the Directors of the Bristol Gas Company are not popular men in their district. The present difficulties have afforded an outlet for all sorts of complaints; and if one is to believe the correspondence columns of the local press, they are mixed up with the supply of inferior gas, certain high-handed proceedings in the matters of deposits from consumers and the payment of "bonuses" to their shareholders in addition to the proper legal profits. The gas-consuming public at Bristol are protected in the manner usually provided by Act of Parliament; and I can scarcely believe that their representatives are so indifferent as to allow anything like a deficiency in the quality of the gas, or an illegal appropriation of profits, to go on unchecked. And the fact that they do not avail themselves of the machinery at their disposal for that purpose, should be sufficient proof, to reasonable minds, that such charges could not be supported in a Court of Law. Be that as it may, it is simply untrue to say that they are harsh or oppressive in their dealings with their retort-house men. As already remarked, the terms that were offered to, and rejected by, the Bristol gas stokers, are as liberal as those which have been asked for in another town.

The local ill-feeling against the Company has taken the unreasonable but not unnatural, form of an undue sympathy for the men, who have been supported in their claims by persons who have not the slightest notion of the "justice" of the same. One would scarcely expect a tinker or a tailor to be capable of forming a sound opinion as to the "justice" or otherwise of the terms of a contract between a retort-house hand and his employer. This public sentiment has been supported and fostered to a remarkable extent by a section of the Bristol public press.

As your readers are aware, matters were brought to a climax by the men giving proper legal notice to leave their employment; and the notice expired on Wednesday last. Under these circumstances, the Directors had secured the services of a number of men from different parts of the country, who were willing to take on when the others left off. So far the matter was simple enough. Neither workmen nor employers were going beyond their legal rights; and it will not be denied that the men had a right to leave, or the employers a right to engage whom they chose. But by some means or other—and it is scarcely to be supposed that it was at the wish, or with the concurrence, of the Directors or their officers—the whole of the arrangements made by these gentlemen were promptly published from day to day in a local newspaper. Even the number of beds they had ordered, the quantity and nature of the provisions they had laid in, the number of men they were expecting, and the different trains by which they would arrive at Bristol, were duly reported in advance; and it would be interesting to know by what means this information was obtained. At the time the trains were expected, the station and its approaches were crowded by a howling mob. The men who had accepted fair and honest employment,

were prevented from entering upon it. The fury of the mob was such that only a few ventured to leave their seats in the vehicles. A band of men succeeded, with the aid of the police, in reaching brakes that were waiting for them; but before they had got far on their way towards the gas-works, a barricade of vehicles was encountered that prevented their further progress. Not content with this, the mob attacked the poor unoffending men with a shower of stones and brickbats, inflicting serious injuries in several cases. The rioters had everything their own way; and the new comers were sent back to their starting places as fast as railway arrangements would permit. Even at the station, a few men wanted to try and get up to the works; but they were deterred by the prospect of losing their free pass back.

So, in the midst of a veritable reign of terror, with the railway station and all the approaches to the gas-works in the possession of King Mob, the Directors, actuated by a desire to protect the comfort and the property of themselves and their neighbours, sent for the representatives of the workmen and gave them what they wanted. The present dispute is thus concluded; and ordinary operations are now resumed at the gas-works. It remains to be seen in what light this matter will be regarded by the labouring classes throughout the country, and especially in the towns where wage agitations are in progress. Meanwhile everyone must contemplate the fact that the Bristol Directors had been able to arrange with fresh workmen for the carrying on of their various operations; but they were prevented by illegal violence from completing their agreement.

GAS WORKMEN AND THE LABOUR QUESTION.

According to Mr. Thorne, the Secretary of the Gas Workers' Union, about 25,000 men have been enrolled as members.

The Gas Committee of the Bolton Corporation have conceded the eight-hour day to the stokers in their employ. The men have been agitating for this for a considerable time.

The gas stokers and enginemen employed at the Middlesbrough Corporation Gas-Works have received an advance in wages from 4s. 8½d. to 5s. per shift of twelve hours.

On the recommendation of the Gas Committee, the Keighley Town Council have decided that the gas stokers shall in future work eight-hour shifts instead of twelve, as at present.

The men employed at the Bath Gas Company's works have submitted to the Directors for their approval the following terms regarding their work and pay:—"That the stokers shall receive 5s. per day for an eight-hour shift, and that each stoker shall draw and charge twenty retorts. That the firemen shall receive similar pay, and be required to work only six fires a shift. That the yardmen shall receive 3s. 6d. for an eight-hour shift. That the labourers shall obtain 3s. 4d. for nine and a half hours' work. That piece work shall be abolished." It is believed that the Directors will give their decision to-morrow (Wednesday).

The following letter has been addressed to the Chairman of the Birmingham Corporation Gas Committee (Alderman Pollack) by Mr. W. F. Beston, the Secretary of the Amalgamated Society of Gas Workers:—"The Council of the Society understand that you have postponed your decision on the memorial lately sent in to you by the carbonizers, on the ground that it needs further consideration. This seems to us rather extraordinary; seeing that, at the time the memorial was sent in, it was stated, and the statement has never been contradicted, that the Committee have had the matter under their consideration for some time. If that was so, we feel that the Committee have had ample time to come to a decision; and we request an immediate reply. It is a difficult matter to keep the men at work, as they feel that they are being trifled with; and unless some decision is come to immediately, we shall be obliged to take decisive measures."

COLONIAL GAS UNDERTAKINGS.

Particulars as to the working of the following Colonial gas undertakings have lately come to hand:—The Launceston (Tasmania) Gas Company had a balance of £2943 at the credit of profit and loss on June 30 last; and they declared a dividend at the rate of 11 per cent. for the year ending at that date. The consumption of gas has largely increased in the suburbs. By the introduction of a coke-breaker, less difficulty has lately been experienced in the disposal of the accumulations of coke; the public beginning now to appreciate it as a fuel. The quantity of coal carbonized in the works (which are under the supervision of Mr. T. S. Cleminshaw), in the six months, was 2025 tons of Newcastle, and 135 tons of shale; the production of gas being 23,460,400 cubic feet. The Rockhampton (Queensland) Gas Company realized profits to the extent of £1796 in the half year ending May 31 last, which with the unappropriated balance brought forward made the amount to the credit of the profit and loss account £2069. From this sum the Directors appropriated £1480 for the payment of a dividend at the rate of 10 per cent. per annum, £300 for the depreciation of plant, and carried forward the balance of £289. The demand for gas is rapidly increasing; rendering further storeage room necessary. The Company have taken steps to obtain an additional Act granting them power to extend their operations to North Rockhampton, and to supply the electric light to residents in both municipalities. The Latrobe Gas Company had an increase of £30 in their returns for the half year ending June 30 last, as compared with the previous six months. They have declared a dividend at the rate of 7 per cent. per annum; and have reduced the price of gas 10d. per 1000 cubic feet as from Jan. 1 next, making the net price 14s. 2d. The Perth (Western Australia) Gas Company had £1711 to divide as the result of their working up to May 31 last; and they disposed of it by declaring a dividend at the rate of 10 per cent. per annum, which took £1500, and adding the remainder to the reserve fund, making it £637. A further discount of 5d. per 1000 cubic feet of gas is now to be allowed on all accounts paid on or before the 15th of each month. At the annual meeting, the Company's Manager (Mr. Wigglesworth) presented a report on the progress of the undertaking. In the course of it he stated that if the numerous coal-fields in the Colony turned out satisfactorily, gas would soon become not only the principal lighting agent, but also be extensively used for lighting, cooking, and heating purposes at a considerable reduction in price, which would be a benefit both to the city and the consumers of gas, and not less so to the shareholders of the Company. The amount standing to the credit of the profit and loss account of the Brisbane Gas Company on the 30th of June last was £10,323, which has been appropriated as follows:—Dividend, at the rate of 5 per cent. per annum, £2611; carried forward, £7712. During the six months ended at the above-named date, the mains were considerably extended in the city and suburbs. Contracts for the enlargement of the retort-house were let; and the work is now well advanced. The sum of £60,000 standing to the credit of the reserve on the 31st of December last has been distributed *pro ratâ* among the shareholders by the creation and allotment at par of 12,000 fully paid shares.

THE Gas and Electricity Supply Committee of the Bradford Town Council have accepted the offer of Messrs. Stainsby and Lyon to purchase the tar produced at the several gas-works of the Corporation at the price of £1 7s. 6d. per ton.

METROPOLIS WATER SUPPLY.

The returns furnished to the Registrar-General by the London Water Companies on the water supply of the Metropolis during the past month, show that the average daily supply was 177,725,797 gallons; being at the rate of 30·1 gallons per head of the population, as compared with 168,890,449 gallons, and 29·1 gallons per head, in the corresponding month of last year. Of the entire bulk of water sent out, 88,925,771 gallons were drawn from the Thames, and 88,800,026 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was—Kent, 1·1; New River, 1·4; Colne Valley, 1·5; Tottenham, 1·6; Southwark, 1·9; East London, 2·1; Chelsea and Grand Junction, 2·3; West Middlesex, 2·4; and Lambeth, 2·5. The water drawn from the Thames by the Chelsea, West Middlesex, Grand Junction, and Lambeth Companies has not quite maintained the high degree of organic purity which it exhibited in August; but the Southwark Company's supply in September was quite equal to that of August, and all the rest of the Thames-derived waters were of good summer quality. All were efficiently filtered before delivery. The water abstracted chiefly from the River Lea by the New River and East London Companies was also efficiently filtered and of high organic purity, more especially the New River Company's supply, which slightly surpassed in this respect two out of the three deep-well waters. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health were, as usual, of a high degree of organic purity; the Kent supply being especially distinguished in this respect. All these waters were clear and bright."

USING THE DIVINING-ROD IN SEARCHING FOR WATER.

A "WATER-FINDER" AT FAULT.

In a letter recently addressed to the *Spectator*, Professor E. Ray Lankester, who shares the very general scepticism as to the powers of the diviner and the divining-rod, described the test to which he and a medical friend submitted Master Rodwell, a "water-finder," who had been exhibiting his powers at a place in the North of England where the Professor and his friend were staying. Professor Lankester's story is as follows:—"It occurred to my medical friend and myself that we could not test the 'discoveries' of Master Rodwell by sinking wells wherever he might indicate water, and we therefore determined to admit, for the sake of further experiment on his powers, that running water existed in the ground beneath his feet, at the spots which he indicated. He was guided in these indications by the forcible upward movement of a V-shaped hazel twig, which he held in his hands. Master Rodwell solemnly perambulated the terrace and roads surrounding L—— Castle, and indicated no less than five spots (widely separate) beneath which he declared running water to exist. Whatever might be the cause, when he stood over these spots his hazel twig firmly rose in his hands. The 'discovered' spots were carefully marked; and Master Rodwell was taken into the castle. He was now scientifically blindfolded—that is to say, large plugs of cotton-wool were placed over his orbits, and bound down by a silk handkerchief. He was led through various parts of the castle, turned round three times at intervals, and brought out to the open by a door other than that from which he had proceeded in his first tour. He stepped almost directly on to one of the spots previously discovered by him; but this time there was no movement of the twig. He was taken over every one of the spots previously marked by him; but in no single case did he re-discover, by aid of the twig, the spot he had marked when he was not blindfolded. On the other hand, he marked nine new spots—as though he were trying (an enemy might say) to hit by luck one of his previous discoveries. The twig moved firmly up at the new spots, as it had at the old ones, on the first, though not on the second round. To complete the proof of this boy's imposture, we made him walk obliquely across a courtyard along the line of a subterranean conduit in which water was actually running at the moment, and at no time whilst he was on this line did the divining-rod erect itself.

The foregoing statement by Professor Lankester has elicited a reply from Dr. M'Clure, the Chairman of the Grinton Mining Company, in whose employ, as a "diviner" Rodwell has been. Dr. M'Clure denies that the lad is an impostor; and states that, when tested, he has never failed to either find water or mineral veins; the lodes having always been found exactly at the places indicated. Rodwell usually walks with his hands tightly clasped before him, and as soon as he steps upon a mineral vein or water he is powerless to unclasp them until he moves away from the region of the lode or conduit. These statements by Dr. M'Clure have excited considerable comment in Yorkshire.

CEARA GAS COMPANY, LIMITED.—The report to be presented at the annual general meeting of this Company on the 25th inst. states that there was a satisfactory increase in the rental in the year ending June 30 last. There was a profit of £4649, which, added to £950 brought forward, made £5599. Deducting the interim dividend (£1452) paid in April, there is left £4147 for division. The Directors recommend the addition of £1000 to the reserve fund, and the declaration of dividends for the six months ended June 30 last of 5 per cent. on the preference shares (less income-tax), and of 5½ per cent. on the ordinary shares (free of income-tax); making, with the interim dividends already paid, 10 per cent. on the preference shares, and 9 per cent. on the ordinary shares for the year. The balance to be carried forward will be £1094.

THE PROPOSED EXTENSION OF THE DARWEN CORPORATION WATER-WORKS.—Last Wednesday, the Sub-Committee of the Darwen Corporation, who have been dealing for a considerable time with the question of the water supply of the borough, issued an exhaustive report on the various schemes they have been inquiring into. The Committee have abandoned the Duckshaw, Manchester, and Jack's Key scheme; and in their report they treat more fully with the Liverpool (Roddlesworth) project and with that which proposes the purchase of two reservoirs from the Blackburn Corporation. They have decided to recommend the latter, for the following reasons:—The scheme is less expensive than the Roddlesworth one, and water can be taken and used by gravitation without the cost of pumping. It is easily within the reach of Darwen, and cannot be said to entail any unnecessarily heavy burden upon the ratepayers. Although at first £100,000 was asked for the two reservoirs at Daisy Green and Pickup Bank, they can now be had for £60,000. The area of the gathering-ground is 537 acres; and the yield would average about 835,000 gallons per day, assuming that sufficient storeage was provided. By process of filtration, the quality of the water will be assured at a high standard of purity. The Blackburn scheme will cost £3240 per annum, according to Mr. W. B. Bryan, the Engineer of the East London Water-Works Company, who, in a supplementary report, considers that the price (£60,000) is a very high one for the reservoirs.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The Aberdeen Town Council has "followed suit" to Dundee, and has resolved to go in for electric lighting. They have the reputation of being an exceedingly cautious race in that part of the country; and it is very probable that little is meant in the resolution of the Council, beyond protection from adventurers in quest of a monopoly. At all events, I presume they will not be in any great haste to give practical effect to their resolution. They would much rather have left the subject alone, had it not been stirred up for them by the four companies who have lodged applications for powers. That it is only in a half-hearted sort of way that they are taking the matter up, may be gathered from the circumstance that the area proposed to be scheduled consists of only one thoroughfare (Union Street) and the railway station—a very small scheme indeed; but just sufficient to keep the electric lighting poachers out, and not to burden the community with too much cost. By the way, in a case like Aberdeen, where the Corporation is the owner of the gas undertaking, is the electric light undertaking to be introduced and its deficits, if any, made up from the profits upon gas? I should say that were unfair. Corporations are bound to charge for gas at a price which will bear all the outlays in providing it; and manifestly that is the only sound condition upon which electricity ought to be introduced—*i.e.*, that those who use it should pay its full cost. It is a point which gas consumers everywhere should see to, that not a farthing of the profits upon their illuminant should be expended upon providing a more extravagant form of lighting for their neighbours.

Along with the proposal that the Dundee Gas Commission should furnish electric light to the citizens, there has also come up the question of broadening the basis of the Commission. At present it is made up of the following:—Seven members appointed by the Town Council, four by the Guildry, five by the Chamber of Commerce, two by the Nine Trades, and one by the Three Trades. Some of these bodies are very much of the close-corporation order; and it is felt that, in a new and important adventure like the supply of electric lighting, the undertaking body should be in closer touch with the community.

The Police Commission, at their meeting last Thursday, adopted a resolution which stated their opinion that the representative basis of the Gas Commission should be enlarged, and that it should then apply to Parliament for power to supply electric light. It was agreed to hold a conference with the Gas Commission on the subject.

The shareholders of the Newport (Fifeshire) Gas Company have this year realized the benefit which results from popularizing the consumption of gas. Last year, in recommending a dividend at the rate of 4 per cent., the Chairman advised that the price of gas be reduced by 5d. per 1000 cubic feet. This was done; and this year the income shows an increase of about £24. The amount was £1468. There was a balance on the year's working of £559, out of which, after writing off £231 for depreciation, a dividend at the increased rate of 5 per cent. was declared.

The Edinburgh Water Trust have approved of regulations which are designed to enable them to meet the requirement in their Act of Parliament that they shall give a constant supply of water. The principal provision is that in houses more than 50 feet above the level of streets which are 200 feet above sea-level, cisterns of 75-gallon capacity, or where there are baths, 100 gallons, shall be fitted up in each house, so that a supply may be obtained at night which will serve during the next day. Some interesting figures were given by Mr. Colston at the meeting of the Edinburgh Water Trust on the 30th ult., at which the rates for the current year were laid on. Mr. Colston stated that when they acquired the concern from the old Company, the debt amounted to £547,000. That consisted of £414,000 of annuities, and £133,000 of mortgage debt. The supply of water was not at all satisfactory; and they had to look abroad for other supplies. In a few years they carried through a scheme which increased the debt to £1,000,000, which was more than double the amount they incurred in taking over the undertaking; for at the present time their indebtedness was £1,136,411. To that, again, there was a counter-part to look to. In 1870-1 the receipts were £42,000; and the rates last year were £84,865. At that time a domestic rate was charged by the old Company of 8½d. per pound; and there was a further charge against the authorities—the Police Commissioners—for sanitary purposes. In other words, £12,000 was paid on the sanitary rate; whereas £36,870 was paid on it now. The rate they charged for manufactories and shipping was 9d. per 1000 gallons. It had been reduced to 6d.; and the shipping had been put in the same ratio as manufactories. When they reduced the rate from 9d. to 6d. per 1000 gallons in 1882-3, there was a falling off in the revenue of about £1700—from £13,809 to £12,148. But year after year the consumption of water by manufactories and for trade purposes produced over £21,000; so that in reality all those had contributed to bring about a reduction of the domestic rate from 8½d. to 6½d. as it now stood. The statement of accounts issued by the Trust shows the revenue during the year 1888-9 to have been £84,865, which was £2093 above the estimate. Domestic supply realized £49,136; and meter, shipping, building, and miscellaneous supplies, £31,580. The expenditure was £80,476, which was £1828 lower than the estimate. The principal items of expenditure were: Interest, £24,326; annuities, £24,220; sinking fund, £9285; taxes, £6665; repairs, £3844; renewal of distribution pipes, £3351; wages, £3131; and salaries, £2492. The estimates for the current year are: Revenue, £85,606, or £2887 more than the estimate for the past year. Expenditure, £84,531, or £2226 8s. 10d. above the estimate for the past year.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday*

Already in various towns the members of the town councils are holding meetings with their constituents to give an account of their work during the past year, and here and there gas and cognate questions are passed in review. At Greenock, on Thursday night, the electors of the First Municipal Ward held their annual meeting, at which each of the three representatives had an "innings." Bailie M'Onie, who is the Convener of the Gas Committee, naturally had something to say about his own special department of public work. He told his audience that at this time last year the Police Board were enabled to reduce the price of gas about 5 per cent., or 2½d. per 1000 cubic feet; and he further remarked that, within the last month or two, another similar reduction had been made, so that at the present time the price stood at 3s. 4d. per 1000 feet, as against 3s. 9d., which was the price when he took charge of the Gas Committee as the Convener. When the proceedings of the meeting came to what is known in connection with elections in Scotland as the "heckling" stage, a number of other interesting matters were brought out by question and answer. One of the electors asked Bailie M'Onie where the £29,000 of the sinking fund belonging to the Gas Trust was at the present time? If it was invested; and, if so, where? If invested, why should it not first be used to pay off the bonds? The reply was that they were bound, by Act of Parliament, to lay aside out of the gas revenue a sum (£3000) every year as a sinking fund to pay off the debt of the Gas Trust. This was paid yearly into the hands of the Town Treasurer; and it was invested as the Finance Committee thought fit. That money, and the interest upon it, went to reduce the debt on the gas-works. The elector still desired to know where it was invested, or, he asked, was it simply a case of taking it out of one pocket and putting it into another? To which the Convener replied that it was invested in the redemption of mortgages. Later on in the course of the proceedings, Bailie M'Onie was asked by the Ward Committee to explain the reason why consumers were not supplied with gas at cost price, instead of dividing the profits amongst the other Town Trusts. His reply was that it was not correct to say that the profits were divided amongst the other Trusts. They were put into the hands of the Town Chamberlain, and were used by him to pay the Police Board expenses. The amount cleared in the shape of profit last year was £2345, which was paid into the hands of the Town Chamberlain, and was applied by him towards paying the ordinary expenses of the Police Board, such as cleansing, lighting, paving, and watching of streets; and if that sum had not been paid into the Treasurer's hands and used for these purposes, there would have been a necessity for additional taxes—2d. or 2½d. per pound on common police taxes. All the ratepayers of Greenock were responsible for the cost and up-keep of the gas-works. Supposing any disaster to occur there, or supposing, through some change in the financial operations, there was a deficit to some extent, then all the ratepayers in the town would be responsible whether or not they burned gas.

On Thursday, at the ordinary meeting of the Town Council of Glasgow, in the minutes of the Gas Committee, the formal appointment of the Treasurer to the Gas Trust was recommended. It was moved, as an amendment, that Mr. Fleming's appointment be delayed until the Gas Committee had considered the advisability of combining the two offices of Water Treasurer and Gas Treasurer; but the Committee's recommendation was carried by 32 votes against 6 for "delay." In the course of the discussion on this matter, Mr. M'Laren, Convener of the Gas Sub-Committee on Finance, stated that the Water Trust and the Gas Trust were constituted under different Acts of Parliament; and it would not be a wise thing at this time to consider the question that had been raised. The recommendation that the retiring Treasurer should receive a half-year's salary (£350) as a token of the Corporation's appreciation of his long and faithful services, met with objection from one of the "economists" of the Council; but he withdrew it on receiving explanations from the Lord Provost and Mr. M'Laren.

On the 5th inst., the Directors of the Saltcoats Gaslight Company "inaugurated" a new gasholder, which had been constructed by Messrs. Brodie and Co., of Paisley. Its capacity is 53,448 cubic feet; the diameter being 60 feet, and the depth 18 feet, with a rise of 30 inches in the centre of the crown. The tank (which is constructed of cast iron) and the holder were designed by Mr. J. Henderson, Manager of the works. This is the fourth holder erected at Saltcoats; the first having been constructed and brought into use 53 years ago. For the purpose of raising the necessary funds to pay for the tank and holder, 400 new shares of £5 each were recently issued. These were taken up by the present shareholders in proportion to their former holdings.

A movement has begun amongst the gas stokers in the employment of the Glasgow Gas Trust for a reduction of the working day to eight hours; and those in the employ of the Greenock Gas Trust, who are working twelve hours per day, are going in for an advance of their wages from 4½d. to 5d. per hour. Their case will be considered at the Police Board meeting on Tuesday.

The shares of the Partick, Hillhead, and Maryhill Gas Company have ranged in price this week at about £5 7s. 6d. per share.

Sulphate of ammonia has declined in price about 5s. per ton since the beginning of the present month, and is now nominally quoted at £11 15s. to £12 per ton. By the way, it may be mentioned that the shipments of this commodity from Leith during last month amounted to 1853 tons, as compared with 1758 tons during September last year.

A most excited condition of things has ruled in the Glasgow pig iron market this week, and prices have gone up by "leaps and bounds" of no mean order. Up to 54s. 6d. per ton cash was reached for Scotch iron yesterday; and the closing settlement price was 54s. 1½d., that of hematite iron being 60s. 6d., while Cleveland iron closed at 49s. 6d. per ton cash buyers.

The coal trade has been exceedingly brisk this week. Prices have stiffened still further; and in various directions wages have again been advanced.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 12.

Sulphate of Ammonia.—The market has been rather slow this week, although there are not lacking symptoms of a better inquiry. Unfortunately, the low quotations of speculators prevent the orders reaching the proper channels; and it is evident that the operations of dealers are based upon the poor prospects of the nitrate market—the values of the latter commodity tending rather downwards. Seeing the divergence of the quotations of the two products for months past, any conclusions about a change in their relative positions are purely imaginary, and cannot therefore by any means be relied upon. The fact remains that sulphate is not being freely offered, either for spot or forward delivery; nor is there, in spite of the quiet market, any perceptible change in values. At Hull, some business in spot parcels is reported at £12; but buyers to-day do not seem inclined to exceed £11 17s. 6d. Leith and Liverpool are steady at the latter figure. The arrivals of nitrate at port of call have been very heavy, but importers seem determined not to give way much in price.

LONDON, *Oct.* 12.

Tar Products maintain their last week's values with but little change. The demand continues steady; and makers have no difficulty in disposing of their production. Prices may be taken as follows:—Pitch, 24s. to 28s. per ton. Tar, 25s. to 30s. per ton, according to position. Benzols (90 per cent.), 3s. 2d. per gallon; (50 per cent.), 2s. 3d. per gallon. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 7d. to 1s. 9d. per gallon. Crude naphtha (30 per cent.), 1s. 2d. per gallon. Light oil, 4d. per gallon. Creosote, 2¾d. per gallon. Carbolic acid (60's), 3s. 5d. to 3s. 6d. per gallon. Cresylic acid, 10d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 1d. to 1s. 1½d. per unit; "B" quality, 11½d. to 1s. per unit.

Ammonia Products.—Sulphate of ammonia is weaker, and sales for spot are difficult to effect even at £11 17s. 6d. Prices: Gas liquor (5° Twaddell), 7s. to 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¾d. per lb. Carbonate of ammonia, 3¼d. per lb. Muriate of ammonia, brown, £19 10s. per ton; white, £28 per ton.

THE Directors of the Kimberley Water-Works Company, Limited, have declared an interim dividend of 5 per cent., free of income-tax, for the half year ended June 30.

THE BATTERSEA VESTRY AND THE LAYING OF GAS AND WATER SERVICE-PIPES.—At the meeting of the Battersea Vestry last Wednesday—Mr. Clandler moved—"That the Clerk be directed to address a communication to the Gas Companies requesting that means may be found for disconnecting their supply-pipes without the necessity of taking up the paving in the highway each time premises which are supplied with gas are vacated or from other causes; and suggesting that disconnection might be effected at the meter, and a seal placed on the connecting-pipe." The motion was adopted; and an opinion expressed that the Water Companies ought to be written to in the same strain.

UNSIGHTLY ELECTRIC LIGHTING POLES.—The work of erecting poles for the supply of electric light in Weybridge has been commenced. It appears, however, that several residents and large ratepayers have complained of what they allege to be the unsightliness of the poles; and a meeting has been called to consider whether any steps should be taken in the matter. It is also complained that the poles are being erected in connection with a scheme for which no Provisional Order has been obtained, or any public inquiry been held. Several persons consider the wires should have been laid underground; but to this the promoters of the scheme reply that the increased cost would be very considerable.

THE SALFORD GAS EXHIBITION.—The exhibition of gas appliances at Salford closed last Saturday evening. The wisdom of the Gas Committee's decision in having this display has been abundantly demonstrated; the interest which it has been the means of arousing as regards the use of gas for domestic purposes other than lighting having been very considerable indeed. The ladies have been especially liberal in their patronage of the exhibition, and of Miss Young's lectures on cookery; and it is hoped that as a result there will be a large demand for gas cooking-stoves. The admissions during the week reached as high a total as 852 on one day, in addition to those present with complimentary and season tickets; and Miss Young's audiences have varied from 125 to 670.

PROPOSED NEW WATER SCHEME FOR MORLEY.—The Corporation of Morley are contemplating the construction of independent works for supplying the borough with water. For twenty years the town has been furnished with water by the Leeds Corporation at a charge of 6d. per 1000 gallons. In 1879 the consumption for the year was 46 million gallons; but during the last twelve months it had reached a total of 130 million gallons. The supply from Leeds has not, however, been equal to the demand; and during the past summer, the Water-Works Committee were in rather sore straits. They had even to obtain an additional supply from Gildersome; and in the last three weeks, above a million gallons has come from this source. Last year £3130 was paid to the Leeds Corporation for water supplied to the town; and the cost of working the pumping apparatus was £558. The Town Council has decided that a Bill shall be deposited in Parliament next session, to give them the necessary powers to carry out a project (at an estimated expenditure of £85,000) that has been devised by Mr. C. Gott, C.E., of Bradford. His scheme is that the water shall be brought from Withen's Clough, Cragg Valley, which lies between Sowerby Bridge and Halifax. By gravitation the water will flow through 20 miles of pipes to the present storeage reservoir at Bruntcliffe, which is capable of holding 1,500,000 gallons. The proposed watershed is 1200 acres in extent. A reservoir is to be constructed in Cragg Valley, which is admirably suited for the purpose, with a capacity of 300 million gallons. Taking into account the quantity of water which will have to be sent into the stream running through the valley as compensation, this will, with a consumption of a million gallons a day, be equal to 200 days' supply.

THE NORTHERN COAL TRADE.—There has lately been an increased demand for gas and manufacturing coal in the North of England; but the inquiry for steam coal shows a falling off. For best Northumbrian steam coal, the price now varies from 9s. 6d. to 9s. 9d. per ton, free on board in the river; but when the requirements extend over next year, the price asked is 10s. or 10s. 6d. Second-class coals are not so strong; but small coals are in brisk demand at about 5s. per ton, free on board. Household coals are only dull for the season; and the production is more than adequate for all requirements. In the gas coal trade, business is enlarging satisfactorily; and the price is also firmer. The fire at one of the large gas coal collieries is increasing the scarcity of this class of coal. A very large quantity is now being sent by sea to London; and local gas companies are also laying in stock. The price for coal for immediate delivery varies from 9s. 6d. to 10s., less 2½ per cent.; so that in a year there has been an advance of more than 3s. per ton. Much of the coal, however, is being sent out on old contracts at the lower prices; but these are running out, and are being replaced by more remunerative ones. Manufacturing coal is very high, and extraordinary prices are asked for next year's contracts—leading manufacturing firms having to pay from 40 to 50 per cent. more for small coal and other qualities to ensure their new year's supply. Against the advance in the price of coal to the gas companies is to be set the increased price for coke, which will be probably at least 2s. 6d. more per ton next year than the contracts have ruled this. There is an inquiry so keen for gas coke for exportation that one shipper, failing to find it locally, sent a steamer to Dublin to ensure a supply, which has been sent to Copenhagen.

THE LONDON COMMISSIONERS OF SEWERS AND THEIR ARTESIAN WELL.—At the meeting of the Commissioners of Sewers of the City of London last Tuesday, the subject of the artesian well which is now being sunk in Whitechapel was again under discussion. Mr. E. Bell moved that the whole matter should be referred to a Special Committee to consider and report, with the view of putting an end to the delay which has occurred in completing the well. He said the contract for the work was originally entered into with Messrs. Hill in 1887; and the well was to be finished in eight months. It had been at a standstill since April last. It had to be sunk 360 feet; and when the works were stopped, they had only descended 150 feet. It would take some months to complete; and the cost would be probably £1500. He found they had only paid the contractors £250. Messrs. Smith and Campbell entered into a fresh contract with the Commission, undertaking to have the work done in eight months. Mr. King proposed, as an amendment, that the matter be referred to the Streets Committee, who had already had it in hand. Mr. Greenwood seconded the amendment. Mr. Sly remarked that when the work was commenced, they thought they were going to show the Water Companies what could be done in supplying water from wells; and their object was to have the thing completed as rapidly as possible, in order to have some sort of lever against the Companies in connection with certain Bills then before Parliament. The position was now entirely different; and he considered it would be better to put the whole matter in the hands of a fresh Committee. The Solicitor (Mr. Baylis), in answer to a member, said the matter came into his hands in June last. He was very anxious to explain what had taken place; but this ought to be done in private, as legal proceedings were threatened. The subject was then discussed *in camera*, and referred to the Streets Committee.

TENDRING HUNDRED WATER COMPANY.—At the recent annual meeting of this Company, a dividend of 3s. per share on the "A" shares was declared for the half year ending June 30 last; and this, with the interim payment of the same amount in February last, makes a dividend of 3 per cent. for the year.

EXTRAORDINARY ACCIDENT AT AN AMERICAN NATURAL GAS-WELL.—A Central News telegram from New York says: A number of engineers, jounalists, and others were invited to view at Jerome, Indiana, last Tuesday, a new natural gas-well, the owners of which had made special preparations to display its properties. During the exhibition a pipe through which the gas was conducted became displaced; and the fluid catching fire at an unintended point, shot an enormous flame among the spectators. These were so situated that it was impossible to immediately draw back; and two persons were burnt to death by the fierce flame. Several others were very seriously injured; and it is feared that some will not recover. The alarming aspect of the roaring flame spread terror amongst the rest of the onlookers, who rushed panic-stricken to escape the danger. In the crush thus occasioned, several persons were maimed and otherwise injured.

ALLEGED IMPURITY OF THE SOUTH STAFFORDSHIRE WATER COMPANY'S SUPPLY.—In the course of the report which the Gas and Water Committee presented at the meeting of the Wednesbury Town Council on Monday of last week, they called attention to the continued unsatisfactory quality of the water supplied to the town by the South Staffordshire Water-Works Company. Mr. Griffiths, in moving the adoption of the report, said that several complaints had been made to the Committee of the unsatisfactory quality of the water supplied to the town; and it was considered by them that steps should be taken by the Council to compel the Water Company to provide a more wholesome supply to the Wood Green and New Town districts, whence most of the complaints emanated. Mr. James, the Chairman of the Water Company, had visited the town, in order to make an inspection of the water; but he, unfortunately, did not apprise the Corporation officials of his visit, which, to his mind, was a great mistake. Mr. Butler observed that, in his opinion, the impurity was due to the fact that the pipes were corroded. Alderman Williams said he found, from inquiries, that the complaints were not general. He had no hesitation in saying that, if some of the persons who found fault would take the trouble to have the water analyzed, they would find it pure. No complaints came from any other district than Wednesbury; and those from only a few persons. After a prolonged discussion, the Mayor (Mr. W. Lloyd) said he understood that the majority of the Company's reservoirs were not covered; and this fact no doubt was the cause of some of the complaints. The report was adopted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 742.)

Issue.	Share	When ex-Dividend.	Dividend on Div. 2 Hands.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Apr.	10½	Alliance & Dublin 10 p. c.	10	19—20	..	5 5 0
100,000	10	„	7½	Do. 7 p. c.	10	13—14	..	5 7 2
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	109—111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	25—27	..	7 8 2
200,000	5	15 May	7½	Bombay, Limited	5	7¼—7¾	−¼	4 16 8
40,000	5	„	7½	Do. New	4	5—5½	..	5 9 4
380,000	Stck.	14 Aug.	19½	Brentford Consolidated	100	228—233	..	5 5 2
125,000	„	„	9½	Do. New	100	162—167	..	5 10 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	43—44	..	5 0 0
320,000	20	27 Sept.	11½	British	20	45—47*	..	4 15 9
60,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
89,000	10	„	8	Do. 7 p. c.	10	14—16	..	5 0 0
828,750	10	30 May	10	Buenos Ayres (New) Limited	10	13½—14½	..	6 18 0
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	106—109	..	5 10 6
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	11 Apr.	13½	Commercial, Old Stock	100	267—272	..	5 1 1
180,000	„	„	10½	Do. New do.	100	213—218	..	4 18 0
180,000	„	28 June	4½	Do. 4½ p. c. Deb. do.	100	122—125	..	3 12 4
557,320	20	14 June	13	Continental Union, Limited	20	47—49	..	5 6 2
242,680	20	„		Do. New '69 & '72	14	33—34	..	5 6 7
200,000	20	„	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	300-305*	..	4 17 7
234,060	10	26 July	13	European, Limited	10	24½—25½	..	5 1 1
130,030	10	„	13	Do. New.	7½	17½—18½	..	5 5 3
854,060	10	„	13	Do. do.	5	12—12½	..	5 3 3
5,470,040	Stck.	14 Aug.	13½	Gaslight & Coke, A, Ordinary	100	246—250	−2½	5 10 0
100,000	„	„	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	255—260	..	3 16 11
80,000	„	„	5	Do. F, 5 p. c. Prf.	100	128—128	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,800,000	„	„	7	Do. H, 7 p. c. max.	100	168—167	−3½	4 3 10
468,000	„	„	10	Do. J, 10 p. c. Prf.	100	253—258	..	3 17 6
1,081,150	„	14 June	4	Do. 4 p. c. Deb. Stk.	100	121—124	..	3 4 6
294,850	„	„	4½	Do. 4½ p. c. do.	100	127—131	..	3 8 8
650,000	„	„	6	Do. 6 p. c. do.	100	171—175	..	3 8 6
3,600,000	Stck.	15 May	10	Imperial Continental	100	208—212	+½	4 14 4
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—115*	..	4 6 11
541,990	20	14 June	6	Monte Video, Limited	20	20—21	−1	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	9—9½	..	5 5 8
60,000	5	27 Sept.	7	Ottoman, Limited	5	6—6½*	..	5 7 7
166,870	10	26 July	4	Pará, Limited	10	4½—5½	..	7 5 3
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	103—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
100,000	10	26 Apr	10	San Paulo, Limited	10	16—18	..	5 11 1
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	305—315	−5	5 3 2
1,350,000	„	„	12½	Do. B do.	100	228—233	−1	5 4 1
141,500	„	„	13½	Do. C do.	100	240—250	..	5 6 0
600,000	„	28 June	5	Do. 5 p. c. Deb. Stk.	100	139—143	..	3 9 11
60,000	5	12 Sept.	11½	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	273—278	..	3 8 4
1,730,560	Stck.	11 Apr.	7½	East London, Ordinary	100	215—220	..	3 8 2
544,440	„	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 1 7
700,000	50	14 June	9	Grand Junction	50	127—132	..	3 8 2
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	259—264	−1	3 8 2
406,200	100	„	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118-121*	..	3 6 1
500,000	100	14 Aug.	12½	New River, New Shares	100	360—365	..	3 6 5
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	174—179	+1	3 7 0
1,126,500	100	„	6	Do. 7½ p. c. do.	100	168—178	..	3 9 4
155,066	Stck.	14 June	10	West Middlesex	100	267—272	..	3 13 6
						*Ex div.		

PROPOSED EXTENSION OF THE LYTHAM GAS-WORKS.—The Lytham Improvement Commissioners have applied to the Local Government Board for power to borrow £1000 to carry out extensions of their gas-works.

OIL LIGHTING AT BEXLEY.—The Bexley Local Board have resolved to considerably extend the area of their lighting district, and erect lamps in the hamlets of Blendon, Black Fen, and Upton. Oil, however, is to be the illuminant.

BARCELONA AND DISTRICT WATER-WORKS, LIMITED.—A Company under the above title was registered last week with a capital of £250,000, in £10 shares, for the purpose of supplying Barcelona and the neighbourhood with water.

KENILWORTH WATER COMPANY.—The annual meeting of this Company was held last Saturday week, when the Directors recommended a dividend of 2 per cent. for the past year—being ½ per cent. increase—and held out the prospect of better results in future. The Company have recently erected plant on the Dowson principle for the manufacture of gas for use at the pumping station; and it was mentioned at the meeting that the Wellington Water Company have effected a great saving by its adoption. The report was passed, and the dividend declared.

THE JOHANNESBURG WATER-WORKS.—The Kimberley Correspondent of the *Financial News*, writing on the 16th ult., said: "The balance-sheet of the Johannesburg Water-Works and Estate Company for the last fourteen months does not, on perusal, present such a satisfactory state of affairs as was to have been expected from the way in which the Company has been puffed up. Whether it be the management or not, the fact stares one in the face that there is a debt incurred of £20,989 16s. 9d., for which interest has to be paid at the rate of 8 per cent. per annum, and that there is only a balance of £10 cash in hand, although a dividend of 7½ per cent. had been declared by the Directors."

ELECTRICITY SUPPLY COMPANY FOR SPAIN, LIMITED.—A Company under this title has been promoted, with a capital of £100,000, in £5 shares, of which 100 are founders' shares, for the purpose, primarily, of erecting a central electricity supply station in Madrid, under a concession recently obtained from the authorities there, for generating electricity and distributing it to premises requiring electric lighting or motive power. The fact of the price of gas in Madrid being about 9s. 3d. per 1000 cubic feet is cited as showing the favourable character of the field for an enterprise of this nature; while it is pointed out that a law has been passed, and is now actually in operation, compelling the adoption of the electric light in theatres.

COMMITTAL OF A GAS STOKER FOR ASSAULT AND INTIMIDATION.—At the Stratford Petty Sessions last Saturday, James Hodson, 30, a gas stoker, was charged on remand with intimidating and assaulting William Smith, at the Beckton Gas-Works, on the 14th ult. The evidence showed that Hodson and Smith were employed at the works, and that on the day in question Smith was asked if he belonged to the Stokers' Union. When he said he did not, he was seized, and the prisoner and four others carried him to a tank, and drenched him to the skin with dirty water used for quenching coke. Some of the water went into his mouth; and in consequence of the wetting he received, he was ill for some time. The Manager was communicated with, and a constable called; after which the prisoner threatened the prosecutor with a piece of timber called a polling-board. The prisoner declared that what was done was merely in fun, and that the men had for some time been "larking" about in the coke-hole. They were squirting water on one another when he went in. The Chairman said the Prisoner was liable to three months' imprisonment with hard labour, or to be sent for trial; and if anything of the kind occurred again, the Bench would probably inflict the full penalty. Prisoner would have to go to gaol for one month, with hard labour.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

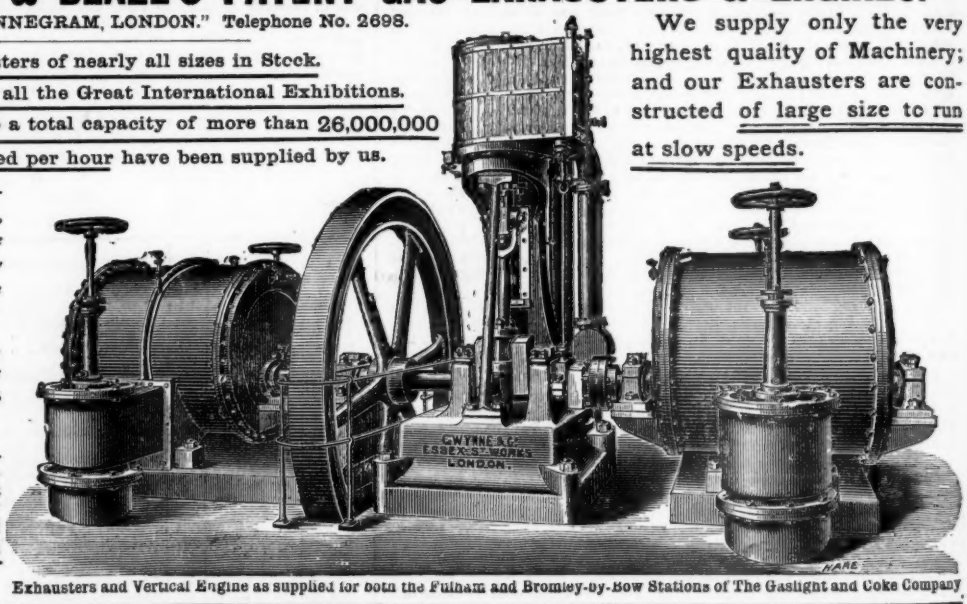
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / No. 54, BERNARD STREET, LEITH, } SCOTLAND.

SULPHATE of Ammonia Lead Work and Fittings. Lead Burner. Tanks and Saturators made and repaired on the shortest notice.
Address P. J. DAVIES, 78, Earl's Court Road, Kensington, LONDON.

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt. Delivered in carboys or railway tank waggons.
For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street, LONDON.

TIMMIS & CO., of STOURBRIDGE
Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats.
All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND CO, 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.
Telegraphic Address: "EIRWAL, LONDON."

W. C. HOLMES & Co., Huddersfield, AND 60, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 770 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award. Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

SHIPPING AND INSURANCE.

FOR Rates of Freight, &c., apply to ROBERT BRUCE FITZMAURICE, 9, Crosby Square LONDON, E.C.

NOTICE OF REMOVAL.

WE have pleasure in informing Engineers, Secretaries, Managers, and the Trade that we have REMOVED to more commodious Offices at MANSION HOUSE CHAMBERS, 20, BUCKLERSBURY, LONDON, E.C., where all Communications will receive, as heretofore, our immediate attention.
J. & H. ROBUS,
Contractors for Gas and Water Works, Mansion House Chambers, 20, Bucklersbury, E.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys.*
Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.
*** See large Advertisement in last week's issue, page 679.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

ESTABLISHED 1869.

HYDRATED Oxide of Iron (Bog Ore). Purity and Uniformity of Quality guaranteed. Stocks kept at MINES for direct Shipments to any Port, also at Garston Docks.
GEO. G. BLACKWELL, Mine Proprietor, 25, 26, and 27, Irwell Chambers, W. LIVERPOOL.

Ashmore, Benson, Pease, & Co., Ltd.,

STOCKTON-ON-TEES,

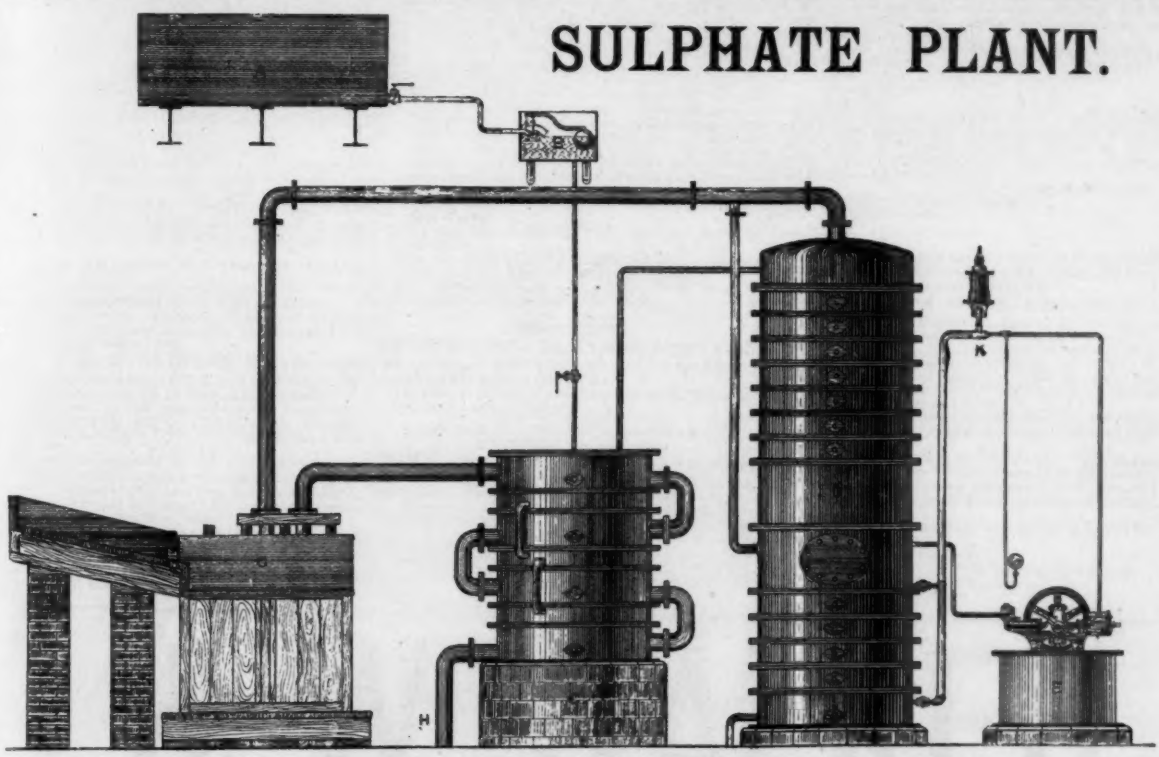
ENGINEERS, IRONFOUNDERS, & CONTRACTORS,

Makers of

Gas Plant, Roofs, Girders, &c.

SOLE MAKERS OF **DAVIS'S PATENT AMMONIA STILLS** FOR

SULPHATE PLANT.



Plant to Produce 20 Tons of Sulphate per Week.

THESE STILLS

Use 4 Cwt. of Fuel per Ton of Sulphate.

Are Economical in Cost and Space.

SIMPLE IN CONSTRUCTION, AND EFFECTIVE IN RESULTS.

Sizes of Stills that are kept in Stock—2, 3, and 4 feet diameter. Larger Sizes made to Order.

Estimates given for Weekly Productions of

SULPHATE FROM TWO TO SIXTY TONS.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Oct. 15, 1889.

ADVERTISER wants permanent Situation in Gas-Works as ASSISTANT MANAGER or DRAUGHTSMAN. Thorough practical and theoretical Knowledge of Gas Engineering in all Branches; has been through Shops and Drawing Office of large Gas Engineering Works. Excellent Testimonials and References. Salary moderate. No objection to going Abroad.
Apply, by letter, to No. 1756, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a competent Man, a Situation as SERVICE LAYER, METER FIXER, INDEX READER, &c. Eleven years in last Situation.
Address A. B., 16, Station Street, STRATFORD, E.

STOKER wanted, by the Aberdare Gas Company. Good Wages and constant Employment offered to a competent and reliable Man.
Apply, with copies of Testimonials, to EVAN JONES, Manager and Secretary, Gas Company, ABERDARE.

THE Corporation of Halifax are prepared to receive APPLICATIONS for the post of OUTDOOR FOREMAN of the Gas Department.
Full particulars of duties may be obtained on application to the Gas Engineer, Mr. Thomas Holgate.
Wages, 35s. per week.
Applications, in applicants' own handwriting, accompanied by not more than three copies of recent testimonials, to be sent to the undersigned on or before Thursday, the 17th of October, 1889.
KEIGHLEY WALTON, Town Clerk.
Town Hall, Halifax, Oct. 3, 1889.

WANTED, a Foreman Stoker, used to Engine and Exhauster. Must be a practical Man, with good References. Wages, 34s. per week.
Address No. 1757, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gasholder (500 to 1000 cubic feet), with Tank and Fittings complete.
Reply, stating price, to the GAS PATENTS SYNDICATE, LIMITED, 37, WALBROOK, E.C.

WANTED, 50 "Bower" Gas-Lamps on the Regenerative Principle. Must be new, or in condition equal to it. Single ones bought.
Address, stating net Cash Price, No. 1755, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, Cheap—Eight strong Ornamental Sexagon LAMPS, in good condition; also eight Fluted Columns, by the Thames Bank Iron Company.
For particulars apply to E. J. WOOLLARD, WALTHAM Cross, N.

SOUTH METROPOLITAN GAS COMPANY.

£50,000 Five per Cent. Perpetual Debenture Stock of the above Company, presenting an Investment of the soundest description.

MR. G. A. WILKINSON is instructed by the Directors to SELL by AUCTION, at the Mart, on Friday, Oct. 18, at Two o'clock precisely, in numerous Lots, to suit large and small Purchasers, £50,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK in the SOUTH METROPOLITAN GAS COMPANY.
The Districts supplied by the Company comprise nearly the whole of the South of London, from Wandsworth to Plumstead Marshes, and the demand has so much increased that the supply of Gas has been nearly doubled within the last Ten years.
Particulars may be had of FRANK BUSH, Esq., Secretary to the Company, 709A, OLD KENT ROAD; of Messrs. JOHNSON, BUDD, and JOHNSON, Solicitors, 24, AUSTIN FRIARS; and of Mr. G. A. WILKINSON, Auctioneer and Land Agent, 7, Poultry, CITY.

LITTLEHAMPTON GAS COMPANY, LIMITED.

540 £5 Shares; being the further portion of the Additional Capital authorized by the Company's Order of 1888, required for the completion of the New Works, will be Sold by Auction by

MR. CHAS. HY. KNIGHT, at the Norfolk Hotel, Littlehampton, in Lots of Four Shares each, on Monday, the 4th of November, 1889, at Three o'clock in the Afternoon.
Full particulars and conditions of Sale may be obtained of the COMPANY'S SECRETARY, or of the AUCTIONEER, LITTLEHAMPTON.

WEST HAM GAS COMPANY.

Important Sale of 173 Original £5 Fully-Paid Shares, which have paid a Dividend of 10 Per Cent. for many years past, but which, under the Company's new Act, can pay a higher Dividend as the Price of Gas is reduced, offering an Investment of the soundest character.

MR. ALFRED RICHARDS will Sell the above by Auction, at the Swan Hotel, Stratford, on Monday, Oct. 21, 1889, at Six for Seven o'clock precisely in the evening in convenient Lots.
Particulars may be obtained of the AUCTIONEER, at 8, NEW BROAD STREET, E.C.

FOR SALE—Single Gasholder, 60 feet diameter by 23 feet deep. Capacity, 65,000 cubic feet; fixed complete; in good condition.
Also one Single GASHOLDER, 80 feet by 20 feet deep, ten Cast-Iron Columns and Wrought-Iron Girders.
Also four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep; 12-inch Centre-Valve and Connections.
Would erect the above, and make practically equal to new.
Inquiries invited for various second-hand Gas Plant—Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

FOR SALE—Messrs. R. and J. Dempster have FOR SALE, owing to the making of some extensive Alterations at the Coventry Gas-Works—
Seven PURIFIERS, 20 feet square, complete with Lids, Grids, Tee-Bars, Lifting Apparatus, &c., &c. The Purifiers are of modern construction, strong and durable, having the Lutes cast on the side Plates; and all Joints are planed. The Purifiers will be sold cheap, either singly or as required to suit purchasers; and they can be delivered free on Rails, or Messrs. R. and J. Dempster will be glad to give a price delivered and fixed complete at any Gas-Works.
Also two 18-inch FOUR-WAY VALVES and Connections.
Also two LIVESEY WASHERS, capable of passing 2 million cubic feet of Gas per day each.
For further particulars, apply to Messrs. R. & J. DEMPSTER, Newton Heath, MANCHESTER.

SPENT OXIDE.

THE Worksop Gas Company have about 45 tons of SPENT BOG ORE ready for delivery, which may be seen at the Works.
Tenders, at price per ton, to be sent to the Manager.
Payment, cash on delivery.

SOCIEDAD CO-OPERATIVA GADITANA DE FABRICACION DE GAS.

THE above-named Society, requiring 3000 tons of COAL for Gas, of first quality, deliverable free in the Bay of Cadiz, during the months of December, January, and February next, solicit TENDERS from Proprietors of Mines or Merchants engaged in this Business, which should be addressed to the President of the Society, residing in Cadiz, Calle de Feduchi, No. 3, accompanied with full particulars.
Reference in London, Messrs. C. J. HAMBRO AND SON.

BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation are prepared to receive TENDERS for the supply of 90 RETORT MOUTHPIECES, with Self-Sealing Lids.
Plans and Specifications may be seen, and forms of tender obtained, on application to Mr. Thomas Holgate, Gas Engineer, Gas-Works, Halifax.
Tenders, endorsed "Mouthpieces," must be sent to the undersigned on or before Thursday, the 17th of October, 1889.
By order,
KEIGHLEY WALTON, Town Clerk.

BOROUGH OF HALIFAX.

THE Gas-Works Committeeof the Halifax Corporation are prepared to receive TENDERS for the supply and fixing of the ASCENSION-PIPES, HYDRAULIC MAINS, FOUL MAINS, and VALVES required for a new Retort-Bench at their Gas-Works.
Plans and specification may be seen, and forms of tender obtained, on application to Mr. Thomas Holgate, Gas Engineer, Gas-Works, Halifax.
Tenders, endorsed "Hydraulics," must be sent to the undersigned on or before Ten a.m., on Friday, the 18th of October, 1889.
By order,
KEIGHLEY WALTON, Town Clerk.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations, during a period of One, Two, or Three years, commencing on the 1st day of January, 1890.
The annual quantities of Tar produced at each of the Stations at present are approximately as follows:—

Avon Street	325,000 gallons.
Canons' Marsh	470,000 "
Stapleton	440,000 "

Further particulars, with forms of tender, may be obtained on application to the undersigned, to whom also tenders sealed, and endorsed "Tender for Tar," must be delivered not later than Ten a.m., on Monday, the 4th day of November prox.
JAMES V. GREEN, Secretary.
Gaslight Offices, Canons' Marsh,
Sept. 20, 1889.

TENDERS FOR GAS-MAINS AND OTHER CASTINGS; ALSO 24-INCH COMPENSATING GOVERNOR AND VALVES.

THE Directors of the Harrogate Gas Company are prepared to receive TENDERS for the supply and delivery of about 1800 yards of 24-inch, 550 yards of 10-inch, and 1450 yards of 8 inch Turned and Bored CAST-IRON GAS-PIPES and SPECIAL CASTINGS connected therewith. Also one Full-Way COMPENSATING GAS GOVERNOR, with or without Bye-pass Connections and Valves.
Specification, with form of tender and all particulars, may be obtained on application to the Engineer, Gas-Works, Harrogate.
Sealed tenders, endorsed respectively "Gas-Mains, &c.," "Governor," or "Valves," are to be delivered to the Secretary of the Gas Company, Harrogate, not later than Twelve noon on Friday, the 25th of October, 1889.
The Company do not bind themselves to accept the lowest or any tender.
By order,
P. H. WILKINSON, Engineer.
Gas Office, James Street, Harrogate,
Oct. 12, 1889.

C. & W. WALKER.

GASHOLDERS; PURIFIERS; PURIFYING MACHINES;

CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;

SULPHATE & SULPHUR PLANT;

RETORT MOUTHPIECES; CONDENSERS;

LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;

SLIDE VALVES; TAR BURNERS; &C. &C.

WOOD SIEVES.

ADDRESSES:

8, Finsbury Circus, London, E.C.; Midland Works, Donnington, Salop.

"FORTRESS LONDON." "FORTRESS DONNINGTON."—Telegraphic.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is hereby given that the Ordinary HALF-YEARLY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on Tuesday, the 5th day of November next, at Three o'clock in the Afternoon precisely, to receive the Directors' Report and the Accounts of the Company, for the Half Year ended the 30th day of June last, to declare a Dividend, to elect an Auditor, and to transact the General Business of the Company.

The Transfer Books will be closed from the 23rd of October to the 5th of November next, both inclusive.

By order of the Board,
ALFRED LASS, Secretary.

Offices: 30, Gracechurch Street,
London, Oct. 8, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Now Ready, Fcap. 4to, Cloth, Gilt Lettered, with numerous Illustrations, price 7s. 6d., post free.

Practical Photometry:

A GUIDE TO THE STUDY OF THE

MEASUREMENT OF LIGHT.

By William Joseph Dibdin, F.I.C., F.C.S.,

Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

Chemist and Superintending Gas Examiner to the London County Council.

The aim of the Author has been to give a comprehensive account of the various methods of Photometry in daily use, and to make the book thoroughly practical by indicating the many precautions necessary for ensuring accurate results in photometrical work. The volume contains chapters on the History and Principles of Photometry; Horizontal, Radial, and Jet Photometers; Standards of Light; the Proposed Substitute for Candles; the Auxiliary Apparatus required in Testing Gas; the Examination and Adjustment of a Gas-Testing Photometer; and Colour and Stellar Photometry; together with an Appendix comprising the Notification of the Metropolitan Gas Referees, Tables for the Correction of Volume of Gas and Observations of Candles, and other matter useful to Photometrists.

London: WALTER KING, 11, Bolt Court, FLEET ST., E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

To effect a great saving in

GAS-FURNACES use our Special Derbyshire **GANNISTER BRICKS.**

ADDRESS
JAMES WHITE & Co.,
ALBERT WORKS, WIDNES.

COKE BREAKERS,
FROM £14 EACH.
(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, S.E.

MARQUIS OF LOTHIAN'S
NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO
MR. JOHN MORISON,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

GEO. E. TOURNAY,
Retort-Setter,
Contractor for the Erection of Retort-Ovens, Chimney Shafts, &c.,
THANNINGTON, CANTERBURY.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

THE ONLY RELIABLE
DRY CENTRE-VALVE.
WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.
ALSO MADE FOR TWO OR THREE PURIFIERS.
No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.
Write for Prospectus.
ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.

F. WECK, 86, NEW STREET, BIRMINGHAM.

COZE'S
AUTOMATIC SYSTEM
OF
Charging and Drawing Retorts.

THIS System of automatically Charging and Discharging Retorts without machinery or arduous labour, which is in operation at several places, will shortly be at work in England.

All information as to the advantages, cost, &c., of the System, can be obtained from the undersigned, who will arrange to grant the user for a small Payment per Retort, or a slight Royalty. The System is fully patented; and any infringer will be strictly proceeded against.

An Agent will shortly be appointed in England.

A. COZE,
MANAGER, RHEIMS GAS COMPANY, FRANCE.

Now Ready, price 15s., limp cloth, the Ninth Yearly

ANALYSIS OF THE ACCOUNTS
OF THE
METROPOLITAN WATER COMPANIES,

CHELSEA, EAST LONDON, GRAND JUNCTION, KENT,
LAMBETH, NEW RIVER, SOUTHWARK & VAUXHALL, AND WEST MIDDLESEX.

SHOWING THE

CAPITAL, INCOME, EXPENDITURE, PROFITS, and DIVIDENDS, per MILLION and per THOUSAND GALLONS of WATER SUPPLIED; the PROPORTION of EXPENDITURE and PROFITS to GROSS INCOME; and the INCOME, EXPENDITURE, and PROFITS per HOUSE, &c., supplied.

FOR THE YEAR ENDED { DEC. 31, 1888. / MARCH 31, 1889.

TOGETHER WITH

THE QUANTITY OF WATER SUPPLIED,
THE ESTIMATED DAILY QUANTITY SUPPLIED FOR DOMESTIC AND OTHER PURPOSES,
THE QUANTITY SUPPLIED PER HEAD OF POPULATION, &c., &c.,

FOR THE YEAR ENDED DECEMBER 31, 1888.

Compiled and arranged by **ALFRED LASS,** Fellow of the Institute of Chartered Accountants.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

Share List will be Re-opened on Oct. 14, and will Close on or before Oct. 24 for Town, and on Oct. 25 for the Country.

THE MID-SUSSEX WATER COMPANY, LIMITED,

Incorporated under the Companies' Acts, 1862 to 1883, whereby the liability of the Shareholders is limited to the amount of their Shares.

Issue of the Remaining Share Capital.

AUTHORIZED SHARE CAPITAL - - - £35,000

In 7000 SHARES of £5 each.

The Directors now invite application for

3576 SHARES OF £5 EACH, AT PAR,

Being the balance of the undisposed Share Capital—Payable £1 per Share on application, £2 per Share on allotment, and the remainder by instalments not exceeding £1 per Share, at intervals of not less than Three Months, to meet the progress of the Works.

DIRECTORS.

LIEUT.-GEN. SIR JOHN STOKES, K.C.B. (a Vice-President Suez Canal), *Chairman*, Good Rest, Hayward's Heath, Sussex.

RICHARD B. EVERED, Esq., Oatlands, Horley (Director of Evered & Co., Ltd., London and Birmingham).

ROBERT FISH, Esq., Assoc. M. Inst. C.E., Bec Lawn, Streatham (Director of Edward Cockey & Sons, Ltd., Frome).

ROBERT CRADOCK NICHOLS, Esq., Highley Manor, Balcombe, Sussex.

*HENRY J. ROBUS, Esq., Edgecumbe House, Addiscombe, Surrey (Vice-Chairman, Horley District Gas Co., Ltd.

* Will join after completion of Contract.

BANKERS.

THE LONDON & SOUTH-WESTERN BANK, Limited, 170, Fenchurch Street, London, E.C.

CONSULTING ENGINEER.

JABEZ CHURCH Esq., M. Inst. C.E., F.G.S., 55, Parliament Street, Westminster, S.W.

SOLICITOR.

J. CROSSLEY COULDWELL, Esq., 93, Gracechurch Street, London, and Hayward's Heath.

SECRETARY.

W. H. HARDY, Esq., F.C.A., F.S.S.

OFFICES.

5, Great Winchester Street, London, E.C.

PROSPECTUS.

This Company has been incorporated for constructing Water-Works, and supplying Pure Deep Well Water within the Parishes and Districts of HAYWARD'S HEATH, CUCKFIELD, LINDFIELD, BALCOMBE, and portions of the PARISHES of WIVELSFIELD and ARDINGLY, all in the COUNTY of SUSSEX.

The District is of a Superior Residential Character, easy of access from London and Brighton. The entire District over which the Company's parliamentary powers extend has a population of 14,000 and upwards; and a supply of good wholesome Water has long been wanted by the inhabitants. This population is mainly dependent for its water on Wells and Ponds containing surface water, often much contaminated; and in Summer even this partial source is seriously limited, causing considerable anxiety to the Residents. There is, therefore, urgent need of Pure Water throughout the whole District. Many of the Wells have already been condemned; and there is little doubt that most of them will be disused as soon as the Works are completed.

The need of a constant and abundant supply of Pure Water for drinking and sanitary purposes is now fully recognized and appreciated.

The Land in possession of the Company (all Freehold), of sufficient extent for present and future requirements, is situated at Balcombe, and has a frontage to the main Road. It is known locally as Shipfield Hill, and is about 1½ miles from Balcombe Railway Station.

The Land being Freehold, no Royalties or Charges whatever are paid by the Company for the Water pumped from the Well.

The Bore Hole (which is lined with Cast-Iron Cylinders) is 285 feet deep, and yields an abundant supply of excellent Water (see Dr. Percy F. Frankland's Report and Analysis herewith). It has now been thoroughly tested by powerful steam pumps working night and day continuously; and the results have proved that in selecting this site for Well and Works, the Directors have secured a most valuable property for the Shareholders.

The large High Service Covered Reservoir is complete.

The large Trunk Mains are already laid; and the Subsidiary Mains are being pushed forward with all speed.

The Pumping Machinery is well in hand.

The Directors anticipate that the Works will be completed, and Water supplied to the District early next year.

Water Companies offer exceptional opportunities to those who are willing to rely on a steady growth in the value of their Investments. The small cost for constructing this Company's Works and Mains, together with the exceptionally advantageous supply of Water, should make its Shares at Par a lucrative Investment; and the Directors feel confident that the working of the Company should result in rapidly increasing Dividends to the Shareholders.

The Capital invested in Water Undertakings probably exceeds £50,000,000, and Water Companies' Stocks and Shares command high premiums. There is also a growing tendency among Investors and Capitalists to invest their money in sound property at home. The following Table will give some idea of the value of Water Companies' Shares and Rates of Dividends. The Mid-Sussex Water Company should, therefore, recommend itself as a profitable and sound investment of Capital.

	Dividend Per Cent.	Amount paid Per Share.	Present Value.
High Wycombe	5	£4	£2 10 0
Hemel Hempsted	6	£10	£12 0 0
Berkhampstead	4½	£10	£12 10 0
Sutton	7½	£100 Stock	£150 0 0
Newbury	5	£5	£7 0 0
Lewes	10	£25	£65 0 0
Luton	10	£10	£14 10 0
Burgess Hill	5½	£10	£13 0 0
Shoreham	10	£10	£15 0 0

The Company, during the Parliamentary Session, 1888, obtained from the Board of Trade, a Provisional Order, authorizing the construction of the above Works and the creation of a Share Capital of £35,000, and Borrowed Capital of £8750. The Act of Parliament confirming the Provisional Order received Royal Assent, 1888.

No promotion money has been or will be paid.

The Works are being constructed by the well-known firm of Messrs. J. and H. Robus of London, under a Contract dated the 5th of September, 1888, between the Company and Messrs. J. and H. Robus, which, together with an Agreement dated the 27th of February, 1889, and the Company's Articles of Association, may be inspected at the Company's Offices.

Where no Allotment is made the Deposit will at once be returned in full.

PROFESSOR FRANKLAND'S REPORT AND ANALYSIS.

Analytical Laboratory, 50, Frith Street, Soho, W.
Sept 9, 1889.

To Jabez Church, Esq., M.I.C.E.

Dear Sir,

Herewith I enclose the results of analysis of the sample of water sent by you on the 31st ult.:—

This water is palatable and contains only the smallest trace of organic matter. It is entirely free from any evidence of previous contamination with sewage or other refuse animal substances, and is of most excellent quality for drinking, and all other dietetic purposes.

Although a hard water, the hardness is not excessive, being no greater than that in ordinary London Water.

I am, faithfully yours,

(Signed) PERCY F. FRANKLAND.

RESULTS OF ANALYSIS EXPRESSED IN PARTS PER 100,000.

DESCRIPTION.

Sample of water from trial borehole sent by Jabez Church, Esq., M.I.C.E.

Number of Sample—8112.

Total solid matters		41·92
Organic Carbon		·036
Organic Nitrogen		·007
Ammonia		·017
Nitrogen as Nitrates and Nitrites	trace	
Total combined Nitrogen		·021
Chlorine		2·85
Hardness—		
Temporary	19·4	
Permanent	2·4	
		21·8

Remarks—Slightly turbid; palatable; no poisonous metals.

Sept. 9, 1889. *(Signed)* PERCY F. FRANKLAND.

∴ ***Prospectuses and Forms of Application for Shares may be obtained of the Secretary, as above.***

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY,
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

Newland Gas Coal

For particulars, apply to
LOCKE & CO.,
NORMANTON,
YORKSHIRE.

CAST-IRON PIPES
FOR GAS AND WATER.
VALVES
FOR GAS, WATER, AND STEAM.

TELEGRAMS "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

GAS AND WATER PIPES.
1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.
GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"PONLEA, STOCKTON-ON-TEES."
"SPRINGBANK, GLASGOW."

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

THOMAS TURTON AND SONS, LIMITED,
Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

THE
"SILVER" LICHT.

CHANDLER'S PATENT.

SUITABLE FOR EVERY FORM OF LIGHTING.
A beautiful white light from ordinary Gas. Silent, steady, and economical.
PACKED IN BOX 9s., SUBJECT.

S. CHANDLER & SONS,
Central Works, Kennington Oval, S.E.

GEORGE McKAIG,
MANUFACTURER OF **WOOD GRIDS** FOR GAS PURIFIERS,
36, Cleveland Street, DONCASTER.

GAS COAL.

POPE & PEARSON, LTD.,
have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17¼ candles.

One ton yields 12¼ cwt. of good coke.

This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft
Illuminating Power	16·3 candles
Coke	70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

BRECKENRIDGE CANNEL,
OF KENTUCKY, U.S.A.

The undersigned, SOLE AGENTS for this celebrated Gas Cannel, now offer it for delivery at any port in
GREAT BRITAIN,
ON THE CONTINENT,
OR SOUTH AMERICA.
This Cannel ranks with the Australian Shale as an enricher of Coal Gas; One Gross Ton producing
15,000 Cubic Feet of 50-Candle Gas, & 26 Bushels of superior Marketable Coke.

FOR PRICES AND FURTHER PARTICULARS, APPLY TO
PERKINS & Co., SOLE AGENTS,
Cable Address: "Perkins New York."
228, PRODUCE EXCHANGE, NEW YORK.

RUSCOE'S PATENT MACHINE

FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.

Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in., 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.

Sole Maker of HELPS' PATENT PIPE EXTRACTOR.

Prices and Particulars on Application to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

THE SCHÜLKE REGENERATIVE LAMP

FOR DOMESTIC AND EXTERNAL LIGHTING

The only Generative Lamp employing the common flat-flame burners.

Lamps giving 20-Candle Power consume less than 4-feet of Gas per hour.

A PURE WHITE AND PERFECTLY STEADY LIGHT NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (brackets or suspending). Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP COMPANY, LTD.,

ROOM 446—11, QUEEN VICTORIA ST., LONDON, E.C.,

WHERE PRICE LISTS AND FULL PARTICULARS MAY BE OBTAINED.

JOSEPH CLIFF AND SONS,

THE ORIGINAL (ESTABLISHED 1795).

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

AT THE PARIS EXHIBITION, 1878,

THREE MEDALS AND HONOURABLE MENTION

WERE AWARDED TO

JOSEPH CLIFF & SONS,

For their Various Exhibits, amongst which is a

SILVER MEDAL FOR THEIR PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this Class.

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

ASHMORE, BENSON, PEASE, & CO., LTD., STOCKTON-ON-TEES.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

JOHN BROWN & CO., LIMITED,
ATLAS STEEL AND IRON WORKS, SHEFFIELD,
ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

D. HULETT & CO., Ltd.

Invite attention to the following Specialities:—

PATENT STREET LAMPS,

NO PUTTY OR OTHER MATERIALS ARE REQUIRED TO SECURE THE GLASS. PRICE 9s. 9d. EACH NET.

D. Hulett's Improved Service Cleanser, for the removal of Naphthalene and other obstructions in Service-Pipes, Price 70s. net.

IMPROVED HIGH-POWER LANTERNS; PRICES ON APPLICATION.

Patentees of Improved Wet and Dry Gas-Meters.

Makers of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.

SHOW-ROOM AND WORKS: **55 & 56, HIGH HOLBORN, LONDON.**

Messrs. Pease and Partners, Ld., Colliery Proprietors, Darlington, write: "Your Composition has given satisfaction wherever we have used it."

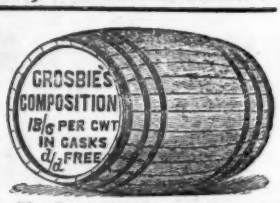
BOILER INCRUSTATION PREVENTED

IN OVER

1250 BOILERS

BY THE USE OF

Crosbie's Composition.

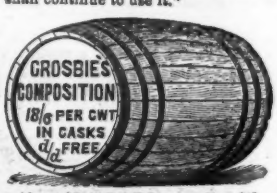


The Pembroke Dock and Town Gas Company write: "Your Boiler Composition is giving satisfaction; and we shall continue to use it."

Sample Drums **20s.** per cwt. d/d.

Scores of Testimonials can be had on application, and references can be given to Engineers, Colliery-Owners, Iron-Works, Cotton-Mills, Paper-Mills, Woollen-Mills, Brewers, Ship-Owners, Gas-Works, Glass-Works, Dyers, Printers, and, in fact, to Steam Users in almost **every Branch of Trade.**

"CROSBIE'S COMPOSITION" is testified by leading Analysts as **absolutely harmless to Metals,** and is certainly the most **economical** means of preventing Incrustation that it is possible to obtain.



Also sold at **2s. 3d.** per gallon d/d.

ADOLPHE CROSBIE, Walsall Street Chemical-Works, WOLVERHAMPTON.

TO GAS MANAGERS. SULPHATE OF AMMONIA PLANT.

CLIFF JOHN, & SONS, 7, WELLINGTON ST., LEEDS. Telegrams—"Fire-Brick, Leeds." Works: "Cliff, Potteries, Runcorn."
FIRE-BRICKS & RETORTS.

N.B. This Firm will quote on application their Discount Price of all Fire-Clay Goods. "Leeds" and "Yorkshire" qualities.

CHEMICAL STONEWARE TAPS
"The best" for resisting Acids.
SEND FOR PRICE LIST.

THE ALBO-CARBON LIGHT.

4-Light Shop Pendant. 52s. complete.

ESTABLISHED ELEVEN YEARS. Hundreds of thousands in use.
UNEQUALLED FOR BRIGHTNESS, SOFTNESS, & ECONOMY.
SINGLE LIGHTS FROM 6S. UPWARDS. CLUSTERS FROM 40S. TO 145S.
SAVE half your Gas Bill. The Greatest Success of the Day.

Albo-Carbon, genuine fluted, 18s. cwt., 3d. lb.

AGENCIES GRANTED. LIBERAL TERMS.
FOR PRICES, ETC., ADDRESS
ALBO-CARBON LIGHT COMPANY, LIMITED, 74c., JAMES STREET, WESTMINSTER, S.W.

SPECIALITIES.

THE "NUGENT" RECUPERATIVE RETORT SETTINGS and FURNACES.

"ROBUS" IMPROVED RETORT SETTINGS, with COKE, TAR, and BREEZE FURNACES.

THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.
Every Particular, with Estimates, forwarded upon Application to
MESSRS. J. & H. ROBUS,
CONTRACTORS FOR THE ERECTION OF GAS & WATER WORKS,
20, BUCKLERSBURY, LONDON, E.C.

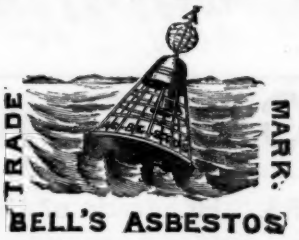
PARIS EXHIBITION.

The GOLD MEDAL

(HIGHEST AWARD, FRENCH SECTION)
HAS BEEN AWARDED TO
THE WENHAM COMPANY, LIMITED,
FOR
REGENERATIVE GAS-LAMPS.
ALSO
The BRONZE MEDAL
FOR
VENTILATION BY GAS-LAMPS.

WORKS AND SHOW-ROOMS:
UPPER OGLE STREET, FITZROY SQUARE, LONDON, W.

BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY 40 PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

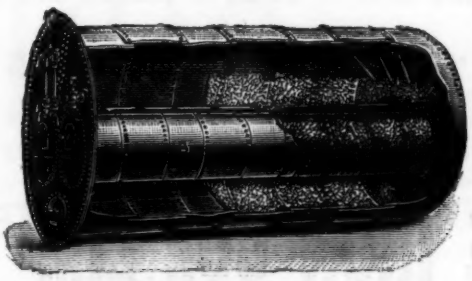
BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

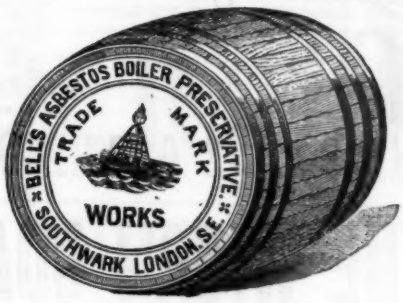
DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street.
CARDIFF: West Bute Street. BIRMINGHAM: 7, John Bright Street. HULL: Humber Dock Basin.
GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN and BARCELONA.

BELL'S ASBESTOS BOILER PRESERVATIVE

Will remove Incrustation from Steam-Boilers of all kinds without chipping.



A shows Boiler Plates when incrusted.
B shows Boiler Plates when cleaned by this Composition.



Every Cask is sent out as above.

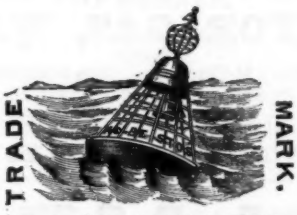
The action of this **BOILER PRESERVATIVE,** by absorbing the free oxygen that is in the water, **entirely checks pitting and corrosion.** It also disintegrates incrustation so immediately as to prevent its adhering to the plates; and the deposit falls to the bottom in a loose powder, which is easily swept out. By keeping boilers clean, a **great economy of fuel is effected,** and the danger of the plates burning is entirely obviated; thus avoiding the great risks which are inseparable from scaled plates, lengthening the life of a boiler, and **covering its own cost a hundredfold.** Whenever possible it should be used through Feed Pump or Injector, which it will also keep clear from incrustation. The small quantity required to effect its purpose makes this the most economical, and more than repays the higher price we charge for a fluid which, in the case of many other makers, is useless.

QUANTITY REQUIRED—A quarter of a pint weekly per horse power indicated; where the water is very bad rather more, or one pint for every 700 gallons of water evaporated.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.

MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
DUBLIN, BERLIN.



DEPÔTS.

BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
CARDIFF: West Bute Street.
And BARCELONA.

SOUTHWARK, BELL'S ASBESTOS. LONDON, S.E.

BELLS ASBESTOS

YARN AND SOAPSTONE PACKING

Is the BEST LOCOMOTIVE PACKING made.

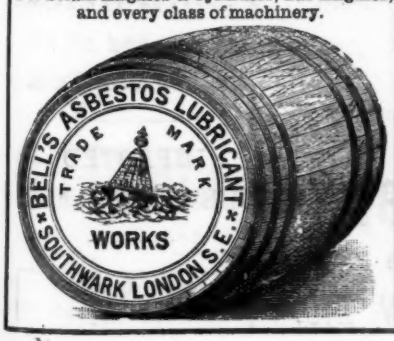
BELL'S

COMPOUND HYDRAULIC PACKING

Is specially suited for Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT

Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



BELL'S ASBESTOLINE

The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS

EXPANSION SHEETING

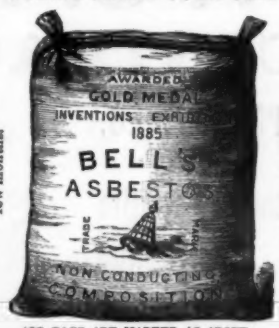
RINGS, AND TAPE.

Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.

BELL'S ASBESTOS

NON-CONDUCTING COMPOSITION.

Will reduce loss by radiation, and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



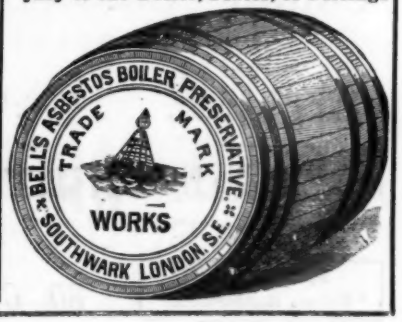
Can be applied again after many years' service.
Is sent out dry in bags; therefore cheaper than others sent on wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS

BOILER PRESERVATIVE

Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings



WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

HORSELEY COMPANY, LTD.

TIPTON, STAFFORDSHIRE.

London Office: 6, Westminster Chambers, Victoria Street.

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS,

AND ALL KINDS OF GAS AND WATER WORKS PLANT.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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CAST-IRON PIPES, ETC.

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[ESTABLISHED OVER 50 YEARS.]

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ALSO

Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

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THE LARGEST MAKERS IN WALES.

W. C. HOLMES & CO.,

CONTRACTING GAS ENGINEERS.

SPECIALITIES.

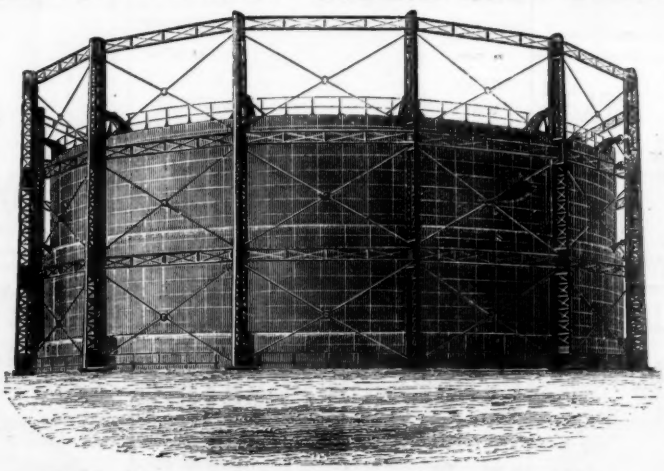
Patent Regenerative Retort-Settings.

Patent Rotary Scrubber-Washer.

Patent Reciprocating Exhauster.

Patent Regulator.

Patent Anti-Dip Pipes.



Treble-Lift Gasholder, 130 ft. by 60 ft., as erected at Burton-on-Trent.

SOLE MAKERS OF

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PATENT

GAS PLANT

Specially adapted for Country Places, and for mixing with Coal Gas to increase Illuminating Power.

Condensers, Scrubbers, Purifiers, and all Fittings for Gas-Works.

IMPROVED CHEMICAL PLANT.

WHITESTONE IRON-WORKS,

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For Telegrams: "Holmes Huddersfield."

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WILONS CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

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THE "LUCIENT" HIGH-POWER & DURABLE GAS-LAMP.

ALEXANDER BROWN'S PATENT.

Gives the most intense, brilliant, and steady white light yet produced from gas. A light of over 270 candles for 13 cubic feet per hour. Such results are unapproached by any other Regenerative Gas-Lamp. To be seen in operation, and full particulars obtained of

ALEXANDER BROWN & Co.,

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First Silver Medal—Highest Award—at the Annual Exhibition of the Royal Cornwall Polytechnic Society, held at Falmouth, Sept. 10 to 14, 1889.

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(Established 50 Years),

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OF

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Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

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R. DEMPSTER & SONS, Ltd.,

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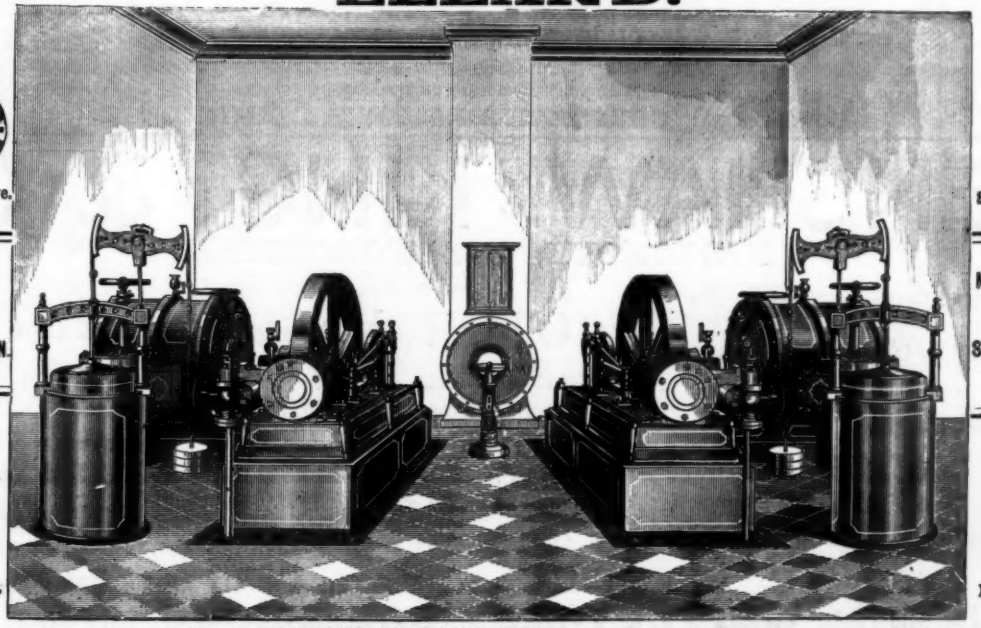
ROSE MOUNT GAS ENGINEERING WORKS, ELLAND.

No. 1. Flange Valve.



No. 5. Screw Valve.

NO SLIP.

NO OSCILLATION.

NO HIGH SPEED.

STEADY GAUGE.

No. 3. Screw Valve.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

DEMPSTERS', ELLAND.

WEST'S GAS IMPROVEMENT CO., LIMITED,

Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **160** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

ADVANTAGES ATTENDING ITS USE ARE:—

INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE** per Ton of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by Wire Rope, Steam, or Compressed Air.—The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of **CIRCULAR, OVAL,** or Ω-shaped **MOUTHPIECES,** with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and at the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

Estimates and further particulars forwarded upon application for Mouthpieces complete, or for Lids and Fastenings separately.

MAKERS OF THOMAS AND SOMERVILLE'S COKE-BREAKING MACHINE.

SOLE MAKERS OF WHITE'S PATENT AUTOMATIC GAS-VALVE.

Mr. JOHN WEST, M. Inst. C.E., Managing Director.

ILLUSTRATED CATALOGUE SENT UPON APPLICATION.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

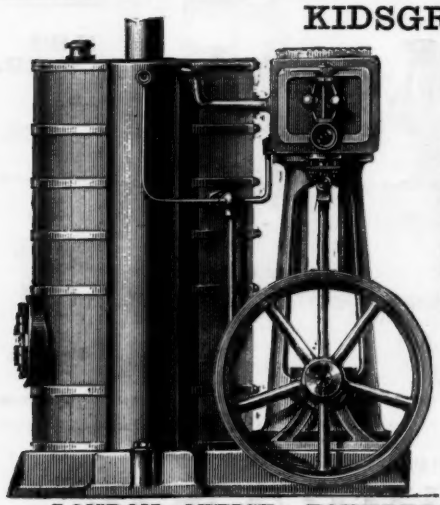
A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

Head Office: CORPORATION STREET, BIRMINGHAM.

RENSHAW, KING, & Co.,

KIDSGROVE, STAFFORDSHIRE,



Sole Makers and Licensees

VICTOR VACUUM ENGINE

(WASTFIELD'S PATENT),

PRIME MOVER, suitable for Tram Cars, Yachts, Hoists, Dynamos, Pumps, and Driving Machinery in Gold Mining, Crushing, Grinding, Cutting, Printing, Ventilating, Farming, &c., &c.

ADVANTAGES: Cost of Fuel ONE FARTHING per hour per horse power. 50 PER CENT. less than Gas-Engines. Absolute safety. Entirely Automatic. Only attention required being for fire at long intervals.

ANY FUEL CAN BE USED.

Furnishes abundance of hot water for heating or other purposes, without affecting motive power.

IS PRACTICALLY NOISELESS, NO SMELL, SMOKE, OR NUISANCE.

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